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(54) Title: NOVEL BACTERIAL POLYPEPTIDES AND POLYNUCLEOTIDES		
(57) Abstract		
<p>This invention relates to newly identified Streptococcal polynucleotides, polypeptides encoded by such polynucleotides, the uses of such polynucleotides and polypeptides, as well as the production of such polynucleotides and polypeptides and recombinant host cells transformed with the polynucleotides. This invention also relates to inhibiting the biosynthesis or action of such polynucleotides or polypeptides and to the use of such inhibitors in therapy.</p>		

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NOVEL BACTERIAL POLYPEPTIDES AND POLYNUCLEOTIDES

FIELD OF THE INVENTION

This invention relates to newly identified polynucleotides and polypeptides, and their production and uses, as well as their variants, agonists and antagonists, and their uses. In particular, in these and in other regards, the invention relates to novel polynucleotides and polypeptides set forth in Table 1.

BACKGROUND OF THE INVENTION

The Streptococci make up a medically important genera of microbes known to cause several types of disease in humans, including otitis media, pneumonia and meningitis. Since its isolation more than 100 years ago, *Streptococcus pneumoniae* (herein *S. pneumoniae*) has been one of the more intensively studied microbes. For example, much of our early understanding that DNA is, in fact, the genetic material was predicated on the work of Griffith and of Avery, Macleod and McCarty using this microbe. Despite the vast amount of research with *S. pneumoniae*, many questions concerning the virulence of this microbe remain.

While certain Streptococcal factors associated with pathogenicity have been identified, e.g., capsule polysaccharides, peptidoglycans, pneumolysins, PspA Complement factor H binding component, autolysin, neuraminidase, peptide permeases, hydrogen peroxide, IgA1 protease, the list is certainly not complete. Further very little is known concerning the temporal expression of such genes during infection and disease progression in a mammalian host. Discovering the sets of genes the bacterium is likely to be expressing at the different stages of infection, particularly when an infection is established, provides critical information for the screening and characterization of novel antibacterials which can interrupt pathogenesis. In addition to providing a fuller understanding of known proteins, such an approach will identify previously unrecognised targets.

GUG is used as an initiating nucleotide, rather than ATG, for a significant number of mRNA's in both Gram positive and Gram negative bacteria. Statistics on the frequency of NTG codons in the start codon for several bacterial species are available on line via computer at http://biochem.otago.ac.nz:800/Transtern/home_page.html.

A discussion of initiation codons in *B. subtilis* is set forth in Vellanoweth, RL.1993 in *Bacillus subtilis* and other Gram Positive Bacteria, Biochemistry, Physiology and Molecular Genetics, Sonenshein, Hoch, Losick Eds. Amer. Soc. Microbiol, Washington DC. p. 699-711. Vellenworth indicates a major difference between *B. subtilis* and the gram-negative organisms is in the choice of initiation codon. 91% of the sequenced *E. coli*

genes start with AUG. By contrast, about 30% of *B. subtilis* and other clostridial branch genes start with UUG or GUG. Moreover, CUG functions as a start codon in *B. subtilis*. Mutations of an AUG initiation codon to GUG or UUG often cause decreased expression in *B. subtilis* and *E. coli*. Generally, translation efficiency is higher with AUG initiation codons. A strong Shine-Delgarno ribosome binding site, however, can compensate almost fully for a weak initiation codon. It has been reported that genes with a range of expression levels have initiation codons other than ATG in gram positives (Vellanoth, RL.1993 in Bacillus subtilis and other Gram Positive Bacteria, Biochemistry, Physiology and Molecular Genetics, Sonenshein, Hoch, Losick Eds. Amer. Soc. Microbiol, Washington DC. p. 699-711).

Provided herein are ORF sequences from genes possessing GUG initiation codons and proteins expressed therefrom and homologues thereto to be used for screening for antimicrobial compounds. Clearly, there is a need for polypeptide and polynucleotide sequences that may be used to screen for antimicrobial compound and which may also be used to determine the roles of such sequences in pathogenesis of infection, dysfunction and disease. There is also need, therefore, for identification and characterization of such sequences which may play a role in preventing, ameliorating or correcting infections, dysfunctions or diseases.

The polypeptides of the invention have amino acid sequence homology to a known protein(s) as set forth in Table 1.

SUMMARY OF THE INVENTION

It is an object of the invention to provide polypeptides that have been identified as novel polypeptides by homology between an amino acid sequence selected from the group consisting of the sequences set out in Table 1 and a known amino acid sequence or sequences of other proteins such as the protein identities listed in Table 1.

It is a further object of the invention to provide polynucleotides that encode novel polypeptides, particularly polynucleotides that encode polypeptides of *Streptococcus pneumoniae*.

In a particularly preferred embodiment of the invention the polynucleotide comprises a region encoding a polypeptide comprising a sequence selected from the group consisting of the sequences set out in Table 1, or a variant of any of these sequences.

In another particularly preferred embodiment of the invention there is a novel protein from *Streptococcus pneumoniae* comprising an amino acid sequence selected from the group consisting of the sequences set out in Table 1, or a variant of any of these sequences.

In accordance with another aspect of the invention there is provided an isolated nucleic acid molecule encoding a mature polypeptide expressible by the *Streptococcus pneumoniae* 0100993 strain contained in the deposited strain.

A further aspect of the invention there are provided isolated nucleic acid molecules encoding a polypeptide of the invention, particularly *Streptococcus pneumoniae* polypeptide, and including mRNAs, cDNAs, genomic DNAs. Further embodiments of the invention include biologically, diagnostically, prophylactically, clinically or therapeutically useful variants thereof, and compositions comprising the same.

In accordance with another aspect of the invention, there is provided the use of a polynucleotide of the invention for therapeutic or prophylactic purposes, in particular genetic immunization. Among the particularly preferred embodiments of the invention are naturally occurring allelic variants of a polypeptide of the invention and polypeptides encoded thereby.

Another aspect of the invention there are provided novel polypeptides of *Streptococcus pneumoniae* as well as biologically, diagnostically, prophylactically, clinically or therapeutically useful variants thereof, and compositions comprising the same.

Among the particularly preferred embodiments of the invention are variants of the polypeptides of the invention encoded by naturally occurring alleles of their genes.

In a preferred embodiment of the invention there are provided methods for producing the aforementioned polypeptides.

In accordance with yet another aspect of the invention, there are provided inhibitors to such polypeptides, useful as antibacterial agents, including, for example, antibodies.

In accordance with certain preferred embodiments of the invention, there are provided products, compositions and methods for assessing expression of the polypeptides and polynucleotides of the invention, treating disease, for example, including, for example, otitis media, conjunctivitis, pneumonia, bacteremia, meningitis, sinusitis, pleural empyema and endocarditis, and most particularly meningitis, such as for example infection of cerebrospinal fluid, assaying genetic variation, and administering a polypeptide or polynucleotide of the invention to an organism to raise an immunological response against a bacteria, especially a *Streptococcus pneumoniae* bacteria.

In accordance with certain preferred embodiments of this and other aspects of the invention there are provided polynucleotides that hybridize to a polynucleotide sequence of the invention, particularly under stringent conditions.

In certain preferred embodiments of the invention there are provided antibodies against polypeptides of the invention.

In other embodiments of the invention there are provided methods for identifying compounds which bind to or otherwise interact with and inhibit or activate an activity of a polypeptide or polynucleotide of the invention comprising: contacting a polypeptide or polynucleotide of the invention with a compound to be screened under conditions to permit binding to or other interaction between the compound and the polypeptide or polynucleotide to assess the binding to or other interaction with the compound, such binding or interaction being associated with a second component capable of providing a detectable signal in response to the binding or interaction of the polypeptide or polynucleotide with the compound; and determining whether the compound binds to or otherwise interacts with and activates or inhibits an activity of the polypeptide or polynucleotide by detecting the presence or absence of a signal generated from the binding or interaction of the compound with the polypeptide or polynucleotide.

In accordance with yet another aspect of the invention, there are provided agonists and antagonists of the polypeptides and polynucleotides of the invention, preferably bacteriostatic or bacteriocidal agonists and antagonists.

In a further aspect of the invention there are provided compositions comprising a polynucleotide or a polypeptide of the invention for administration to a cell or to a multicellular organism.

Various changes and modifications within the spirit and scope of the disclosed invention will become readily apparent to those skilled in the art from reading the following descriptions and from reading the other parts of the present disclosure.

GLOSSARY

The following definitions are provided to facilitate understanding of certain terms used frequently herein.

"Disease(s)" means any bacterial infection, but preferably a streptococcal infection, such as, otitis media, conjunctivitis, pneumonia, bacteremia, meningitis, sinusitis, pleural empyema, endocarditis, meningitis, and infection of cerebrospinal fluid.

"Host cell" is a cell which has been transformed or transfected, or is capable of transformation or transfection by an exogenous polynucleotide sequence.

"Identity," as known in the art, is a relationship between two or more polypeptide sequences or two or more polynucleotide sequences, as determined by comparing the sequences. In the art, "identity" also means the degree of sequence relatedness between polypeptide or polynucleotide sequences, as the case may be, as determined by the match between strings.

of such sequences. "Identity" and "similarity" can be readily calculated by known methods, including but not limited to those described in (*Computational Molecular Biology*, Lesk, A.M., ed., Oxford University Press, New York, 1988; *Biocomputing: Informatics and Genome Projects*, Smith, D.W., ed., Academic Press, New York, 1993; *Computer Analysis of Sequence Data*, Part I, Griffin, A.M., and Griffin, H.G., eds., Humana Press, New Jersey, 1994; *Sequence Analysis in Molecular Biology*, von Heinje, G., Academic Press, 1987; and *Sequence Analysis Primer*, Gribskov, M. and Devereux, J., eds., M Stockton Press, New York, 1991; and Carillo, H., and Lipman, D., *SIAM J. Applied Math.*, 48: 1073 (1988). Preferred methods to determine identity are designed to give the largest match between the sequences tested. Methods to determine identity and similarity are codified in publicly available computer programs. Preferred computer program methods to determine identity and similarity between two sequences include, but are not limited to, the GCG program package (Devereux, J., et al., *Nucleic Acids Research* 12(1): 387 (1984)), BLASTP, BLASTN, and FASTA (Atschul, S.F. et al., *J. Molec. Biol.* 215: 403-410 (1990). The BLAST X program is publicly available from NCBI and other sources (*BLAST Manual*, Altschul, S., et al., NCBI NLM NIH Bethesda, MD 20894; Altschul, S., et al., *J. Mol. Biol.* 215: 403-410 (1990). As an illustration, by a polynucleotide having a nucleotide sequence having at least, for example, 95% "identity" to a reference nucleotide sequence it is intended that the nucleotide sequence of the tested polynucleotide is identical to the reference sequence except that the polynucleotide sequence may include up to five point mutations per each 100 nucleotides of the reference nucleotide sequence. In other words, to obtain a polynucleotide having a nucleotide sequence at least 95% identical to a reference nucleotide sequence, up to 5% of the nucleotides in the reference sequence may be deleted or substituted with another nucleotide, or a number of nucleotides up to 5% of the total nucleotides in the reference sequence may be inserted into the reference sequence. These mutations of the reference sequence may occur at the 5' or 3' terminal positions of the reference nucleotide sequence or anywhere between those terminal positions, interspersed either individually among nucleotides in the reference sequence or in one or more contiguous groups within the reference sequence. Analogously, by a polypeptide having an amino acid sequence having at least, for example, 95% identity to a reference amino acid sequence is intended that the test amino acid sequence of the polypeptide is identical to the reference sequence except that the polypeptide sequence may include up to five amino acid alterations per each 100 amino acids of the reference amino acid. In other words, to obtain a polypeptide having an amino acid sequence at least 95% identical to a reference amino

acid sequence, up to 5% of the amino acid residues in the reference sequence may be deleted or substituted with another amino acid, or a number of amino acids up to 5% of the total amino acid residues in the reference sequence may be inserted into the reference sequence. These alterations of the reference sequence may occur at the amino or carboxy terminal positions of the reference amino acid sequence or anywhere between those terminal positions, interspersed either individually among residues in the reference sequence or in one or more contiguous groups within the reference sequence.

"Isolated" means altered "by the hand of man" from its natural state, *i.e.*, if it occurs in nature, it has been changed or removed from its original environment, or both. For example, a polynucleotide or a polypeptide naturally present in a living organism is not "isolated," but the same polynucleotide or polypeptide separated from the coexisting materials of its natural state is "isolated", as the term is employed herein.

"Polynucleotide(s)" generally refers to any polyribonucleotide or polydeoxribonucleotide, which may be unmodified RNA or DNA or modified RNA or DNA. "Polynucleotide(s)" include, without limitation, single- and double-stranded DNA, DNA that is a mixture of single- and double-stranded regions or single-, double- and triple-stranded regions, single- and double-stranded RNA, and RNA that is mixture of single- and double-stranded regions, hybrid molecules comprising DNA and RNA that may be single-stranded or, more typically, double-stranded, or triple-stranded regions, or a mixture of single- and double-stranded regions. In addition, "polynucleotide" as used herein refers to triple-stranded regions comprising RNA or DNA or both RNA and DNA. The strands in such regions may be from the same molecule or from different molecules. The regions may include all of one or more of the molecules, but more typically involve only a region of some of the molecules. One of the molecules of a triple-helical region often is an oligonucleotide. As used herein, the term "polynucleotide(s)" also includes DNAs or RNAs as described above that contain one or more modified bases. Thus, DNAs or RNAs with backbones modified for stability or for other reasons are "polynucleotide(s)" as that term is intended herein. Moreover, DNAs or RNAs comprising unusual bases, such as inosine, or modified bases, such as tritylated bases, to name just two examples, are polynucleotides as the term is used herein. It will be appreciated that a great variety of modifications have been made to DNA and RNA that serve many useful purposes known to those of skill in the art. The term "polynucleotide(s)" as it is employed herein embraces such chemically, enzymatically or metabolically modified forms of polynucleotides, as well as the chemical forms of DNA and RNA characteristic of viruses and cells, including, for

example, simple and complex cells. "Polynucleotide(s)" also embraces short polynucleotides often referred to as oligonucleotide(s).

"Polypeptide(s)" refers to any peptide or protein comprising two or more amino acids joined to each other by peptide bonds or modified peptide bonds. "Polypeptide(s)" refers to both short chains, commonly referred to as peptides, oligopeptides and oligomers and to longer chains generally referred to as proteins. Polypeptides may contain amino acids other than the 20 gene encoded amino acids. "Polypeptide(s)" include those modified either by natural processes, such as processing and other post-translational modifications, but also by chemical modification techniques. Such modifications are well described in basic texts and in more detailed monographs, as well as in a voluminous research literature, and they are well known to those of skill in the art. It will be appreciated that the same type of modification may be present in the same or varying degree at several sites in a given polypeptide. Also, a given polypeptide may contain many types of modifications. Modifications can occur anywhere in a polypeptide, including the peptide backbone, the amino acid side-chains, and the amino or carboxyl termini. Modifications include, for example, acetylation, acylation, ADP-ribosylation, amidation, covalent attachment of flavin, covalent attachment of a heme moiety, covalent attachment of a nucleotide or nucleotide derivative, covalent attachment of a lipid or lipid derivative, covalent attachment of phosphatidylinositol, cross-linking, cyclization, disulfide bond formation, demethylation, formation of covalent cross-links, formation of cysteine, formation of pyroglutamate, formylation, gamma-carboxylation, glycosylation, GPI anchor formation, hydroxylation, iodination, methylation, myristoylation, oxidation, proteolytic processing, phosphorylation, prenylation, racemization, glycosylation, lipid attachment, sulfation, gamma-carboxylation of glutamic acid residues, hydroxylation and ADP-ribosylation, selenoylation, sulfation, transfer-RNA mediated addition of amino acids to proteins, such as arginylation, and ubiquitination. See, for instance, *PROTEINS - STRUCTURE AND MOLECULAR PROPERTIES*, 2nd Ed., T. E. Creighton, W. H. Freeman and Company, New York (1993) and Wold, F., Posttranslational Protein Modifications: Perspectives and Prospects, pgs. 1-12 in *POSTTRANSLATIONAL COVALENT MODIFICATION OF PROTEINS*, B. C. Johnson, Ed., Academic Press, New York (1983); Seifter et al., *Meth. Enzymol.* 182:626-646 (1990) and Rattan et al., *Protein Synthesis: Posttranslational Modifications and Aging*, Ann. N.Y. Acad. Sci. 663: 48-62 (1992). Polypeptides may be branched or cyclic, with or without branching. Cyclic, branched and branched circular polypeptides may result from post-translational natural processes and may be made by entirely synthetic methods, as well.

"Variant(s)" as the term is used herein, is a polynucleotide or polypeptide that differs from a reference polynucleotide or polypeptide respectively, but retains essential properties. A typical variant of a polynucleotide differs in nucleotide sequence from another, reference polynucleotide. Changes in the nucleotide sequence of the variant may or may not alter the amino acid sequence of a polypeptide encoded by the reference polynucleotide. Nucleotide changes may result in amino acid substitutions, additions, deletions, fusions and truncations in the polypeptide encoded by the reference sequence, as discussed below. A typical variant of a polypeptide differs in amino acid sequence from another, reference polypeptide. Generally, differences are limited so that the sequences of the reference polypeptide and the variant are closely similar overall and, in many regions, identical. A variant and reference polypeptide may differ in amino acid sequence by one or more substitutions, additions, deletions in any combination. A substituted or inserted amino acid residue may or may not be one encoded by the genetic code. A variant of a polynucleotide or polypeptide may be a naturally occurring such as an allelic variant, or it may be a variant that is not known to occur naturally. Non-naturally occurring variants of polynucleotides and polypeptides may be made by mutagenesis techniques, by direct synthesis, and by other recombinant methods known to skilled artisans.

DESCRIPTION OF THE INVENTION

Each of polynucleotide and polypeptide sequences provided herein may be used in the discovery and development of antibacterial compounds. Upon expression of the sequences with the appropriate initiation and termination codons the encoded polypeptide can be used as a target for the screening of antimicrobial drugs. Additionally, the DNA sequences encoding preferably the amino terminal regions of the encoded protein or the Shine-Delgarno region can be used to construct antisense sequences to control the expression of the coding sequence of interest. Furthermore, many of the sequences disclosed herein also provide regions upstream and downstream from the encoding sequence. These sequences are useful as a source of regulatory elements for the control of bacterial gene expression. Such sequences are conveniently isolated by restriction enzyme action or synthesized chemically and introduced, for example, into promoter identification strains. These strains contain a reporter structural gene sequence located downstream from a restriction site such that if an active promoter is inserted, the reporter gene will be expressed.

Although each of the sequences may be employed as described above, this invention also provides several means for identifying particularly useful target genes. The

first of these approaches entails searching appropriate databases for sequence matches in related organisms. Thus, if a homologue exists, the Streptococcal-like form of this gene would likely play an analogous role. For example, a Streptococcal protein identified as homologous to a cell surface protein in another organism would be useful as a vaccine candidate. To the extent such homologies have been identified for the sequences disclosed herein they are reported along with the encoding sequence.

Each of the DNA sequences provided herein may be used in the discovery and development of antibacterial compounds. Because each of the sequences contains an open reading frame (ORF) with an appropriate initiation and termination codons, the encoded protein upon expression can be used as a target for the screening of antimicrobial drugs. Additionally, the DNA sequences encoding the amino terminal regions of the encoded protein can be used to construct antisense sequences to control the expression of the coding sequence of interest. Furthermore, many of the sequences disclosed herein also provide regions upstream and downstream from the encoding sequence. These sequences are useful as a source of regulatory elements for the control of bacterial gene expression. Such sequences are conveniently isolated by restriction enzyme action or synthesized chemically and introduced, for example, into promoter identification strains. These strains contain a reporter structural gene sequence located downstream from a restriction site such that if an active promoter is inserted, the reporter gene will be expressed.

It is believed that bacteria possess a number of ways of regulating gene expression levels, especially in subtle degrees, and the interplay between ribosome binding site and initiation codon is utilized for this purpose for these genes. It is also believed that such genes will be important targets for antimicrobial drug discovery, particularly since pathogenesis genes are believed undergo gene expression regulation during in the pathogenesis process. Therefore, the invention provides ORF sequences possessing a GTG (GUG) initiation codon and protein targets expressed therefrom.

Although each of the sequences may be employed as described above, this invention also provides several means for identifying particularly useful target genes. The first of these approaches entails searching appropriate databases for sequence matches in related organisms. Thus, if a homologue exists, the Streptococcal-like form of this gene would likely play an analogous role. For example, a Streptococcal protein identified as homologous to a cell surface protein in another organism would be useful as a vaccine candidate. To the extent such homologies have been identified for the sequences disclosed herein they are reported along with the encoding sequence.

ORF Gene Expression

Recently techniques have become available to evaluate temporal gene expression in bacteria, particularly as it applies to viability under laboratory and infection conditions. A number of methods can be used to identify genes which are essential to survival *per se*, or essential to the establishment/maintenance of an infection. Identification of an ORF unknown by one of these methods yields additional information about its function and permits the selection of such an ORF for further development as a screening target. Briefly, these approaches include:

1) **Signature Tagged Mutagenesis (STM):** This technique is described by Hensel *et al.*, Science 269: 400-403(1995), the contents of which is incorporated by reference for background purposes. Signature tagged mutagenesis identifies genes necessary for the establishment/maintenance of infection in a given infection model.

The basis of the technique is the random mutagenesis of target organism by various means (e.g., transposons) such that unique DNA sequence tags are inserted in close proximity to the site of mutation. The tags from a mixed population of bacterial mutants and bacteria recovered from an infected hosts are detected by amplification, radiolabeling and hybridisation analysis. Mutants attenuated in virulence are revealed by absence of the tag from the pool of bacteria recovered from infected hosts.

In *Streptococcus pneumoniae*, because the transposon system is less well developed, a more efficient way of creating the tagged mutants is to use the insertion-duplication mutagenesis technique as described by Morrison *et al.*, J. Bacteriol. 159:870 (1984) the contents of which is incorporated by reference for background purposes.

2) **In Vivo Expression Technology (IVET):** This technique is described by Camilli *et al.*, Proc. Nat'l. Acad. Sci. USA. 91:2634-2638 (1994), the contents of which is incorporated by reference for background purposes. IVET identifies genes up-regulated during infection when compared to laboratory cultivation, implying an important role in infection. ORF identified by this technique are implied to have a significant role in infection establishment/maintenance.

In this technique random chromosomal fragments of target organism are cloned upstream of a promoter-less recombinase gene in a plasmid vector. This construct is introduced into the target organism which carries an antibiotic resistance gene flanked by resolvase sites. Growth in the presence of the antibiotic removes from the population those fragments cloned into the plasmid vector capable of supporting transcription of the recombinase gene and therefore have caused loss of antibiotic resistance. The resistant pool

is introduced into a host and at various times after infection bacteria may be recovered and assessed for the presence of antibiotic resistance. The chromosomal fragment carried by each antibiotic sensitive bacterium should carry a promoter or portion of a gene normally upregulated during infection. Sequencing upstream of the recombinase gene allows identification of the up regulated gene.

3) Differential display: This technique is described by Chuang *et al.*, *J. Bacteriol.* 175:2026-2036 (1993), the contents of which is incorporated by reference for background purposes. This method identifies those genes which are expressed in an organism by identifying mRNA present using randomly-primed RT-PCR. By comparing pre-infection and post infection profiles, genes up and down regulated during infection can be identified and the RT-PCR product sequenced and matched to ORF 'unknowns'.

4) Generation of conditional lethal mutants by transposon mutagenesis: This technique, described by de Lorenzo, V. *et al.*, *Gene* 123:17-24 (1993); Neuwald, A. F. *et al.*, *Gene* 125: 69-73(1993); and Takiff, H. E. *et al.*, *J. Bacteriol.* 174:1544-1553(1992), the contents of which is incorporated by reference for background purposes, identifies genes whose expression are essential for cell viability.

In this technique transposons carrying controllable promoters, which provide transcription outward from the transposon in one or both directions, are generated. Random insertion of these transposons into target organisms and subsequent isolation of insertion mutants in the presence of inducer of promoter activity ensures that insertions which separate promoter from coding region of a gene whose expression is essential for cell viability will be recovered. Subsequent replica plating in the absence of inducer identifies such insertions, since they fail to survive. Sequencing of the flanking regions of the transposon allows identification of site of insertion and identification of the gene disrupted. Close monitoring of the changes in cellular processes/morphology during growth in the absence of inducer yields information on likely function of the gene. Such monitoring could include flow cytometry (cell division, lysis, redox potential, DNA replication), incorporation of radiochemically labeled precursors into DNA, RNA, protein, lipid, peptidoglycan, monitoring reporter enzyme gene fusions which respond to known cellular stresses.

5) Generation of conditional lethal mutants by chemical mutagenesis: This technique is described by Beckwith, J., *Methods in Enzymology* 204: 3-18(1991), the contents of which are incorporated herein by reference for background purposes. In this technique random chemical mutagenesis of target organism, growth at

temperature other than physiological temperature (permissive temperature) and subsequent replica plating and growth at different temperature (e.g. 42°C to identify ts, 25°C to identify cs) are used to identify those isolates which now fail to grow (conditional mutants). As above close monitoring of the changes upon growth at the non-permissive temperature yields information on the function of the mutated gene. Complementation of conditional lethal mutation by library from target organism and sequencing of complementing gene allows matching with unknown ORF.

6) RT-PCR: *Streptococcus pneumoniae* messenger RNA is isolated from bacterial infected tissue e.g. 48 hour murine lung infections, and the amount of each mRNA species assessed by reverse transcription of the RNA sample primed with random hexanucleotides followed by PCR with gene specific primer pairs. The determination of the presence and amount of a particular mRNA species by quantification of the resultant PCR product provides information on the bacterial genes which are transcribed in the infected tissue. Analysis of gene transcription can be carried out at different times of infection to gain a detailed knowledge of gene regulation in bacterial pathogenesis allowing for a clearer understanding of which gene products represent targets for screens for novel antibacterials. Because of the gene specific nature of the PCR primers employed it should be understood that the bacterial mRNA preparation need not be free of mammalian RNA. This allows the investigator to carry out a simple and quick RNA preparation from infected tissue to obtain bacterial mRNA species which are very short lived in the bacterium (in the order of 2 minute halflives). Optimally the bacterial mRNA is prepared from infected murine lung tissue by mechanical disruption in the presence of TRIzol (GIBCO-BRL) for very short periods of time, subsequent processing according to the manufacturers of TRIzol reagent and DNAase treatment to remove contaminating DNA. Preferably the process is optimised by finding those conditions which give a maximum amount of *Streptococcus pneumoniae* 16S ribosomal RNA as detected by probing Northernblots with a suitably labelled sequence specific oligonucleotide probe. Typically a 5' dye labelled primer is used in each PCR primer pair in a PCR reaction which is terminated optimally between 8 and 25 cycles. The PCR products are separated on 6% polyacrylamide gels with detection and quantification using GeneScanner (manufactured by ABI).

Each of these techniques may have advantages or disadvantage depending on the particular application. The skilled artisan would choose the approach that is the most relevant with the particular end use in mind.

Use of the of these technologies when applied to the ORFs of the present invention enables identification of bacterial proteins expressed during infection, inhibitors of which would have utility in anti-bacterial therapy.

The invention relates to novel polypeptides and polynucleotides as described in greater detail below. In particular, the invention relates to polypeptides and polynucleotides of *Streptococcus pneumoniae*, which is related by amino acid sequence homology to known polypeptide as set forth in Table 1. The invention relates especially to compounds having the nucleotide and amino acid sequence selected from the group consisting of the sequences set out in Table 1, and to the nucleotide sequences of the DNA in the deposited strain and amino acid sequences encoded thereby.

Deposited materials

The deposit has been made under the terms of the Budapest Treaty on the International Recognition of the Deposit of Micro-organisms for Purposes of Patent Procedure. The strain will be irrevocably and without restriction or condition released to the public upon the issuance of a patent. The deposit is provided merely as convenience to those of skill in the art and is not an admission that a deposit is required for enablement, such as that required under 35 U.S.C. §112.

A deposit containing a *Streptococcus pneumoniae* bacterial strain has been deposited with the National Collections of Industrial and Marine Bacteria Ltd. (NCIMB), 23 St. Machar Drive, Aberdeen AB2 1RY, Scotland on 11 April 1996 and assigned NCIMB Deposit No. 40794. The *Streptococcus pneumoniae* bacterial strain deposit is referred to herein as "the deposited bacterial strain" or as "the DNA of the deposited bacterial strain."

The deposited material is a bacterial strain that contains the full length FabH DNA, referred to as "NCIMB 40794" upon deposit.

The sequence of the polynucleotides contained in the deposited material, as well as the amino acid sequence of the polypeptide encoded thereby, are controlling in the event of any conflict with any description of sequences herein.

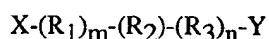
A license may be required to make, use or sell the deposited materials, and no such license is hereby granted.

The deposited strain contains the full length genes comprising the polynucleotides set forth in Table 1. The sequence of the polynucleotides contained in the deposited strain, as well as the amino acid sequence of the polypeptide encoded thereby, are controlling in the event of any conflict with any description of sequences herein.

Polypeptides

The polypeptides of the invention include the polypeptides set forth in Table 1 (in particular the mature polypeptide) as well as polypeptides and fragments, particularly those which have the biological activity of a polypeptide of the invention, and also those which have at least 50%, 60% or 70% identity to a polypeptide sequence selected from the group consisting of the sequences set out in Table 1 or the relevant portion, preferably at least 80% identity to a polypeptide sequence selected from the group consisting of the sequences set out in Table 1, and more preferably at least 90% similarity (more preferably at least 90% identity) to a polypeptide sequence selected from the group consisting of the sequences set out in Table 1, and still more preferably at least 95% similarity (still more preferably at least 95% identity) to a polypeptide sequence selected from the group consisting of the sequences set out in Table 1, and also include portions of such polypeptides with such portion of the polypeptide generally containing at least 30 amino acids and more preferably at least 50 amino acids.

The invention also includes polypeptides of the formula:



wherein, at the amino terminus, X is hydrogen, and at the carboxyl terminus, Y is hydrogen or a metal, R_1 and R_3 are any amino acid residue, n is an integer between 1 and 2000, m is an integer between 1 and 2000, and R_2 is an amino acid sequence of the invention, particularly an amino acid sequence selected from the group set forth in Table 1. In the formula above R_2 is oriented so that its amino terminal residue is at the left, bound to R_1 , and its carboxy terminal residue is at the right, bound to R_3 . Any stretch of amino acid residues denoted by either R group, where R is greater than 1, may be either a heteropolymer or a homopolymer, preferably a heteropolymer. In preferred embodiments n is an integer between 1 and 1000 or 2000.

A fragment is a variant polypeptide having an amino acid sequence that entirely is the same as part but not all of the amino acid sequence of the aforementioned polypeptides. As with polypeptides, fragments may be "free-standing," or comprised within a larger polypeptide of which they form a part or region, most preferably as a single continuous region, a single larger polypeptide.

Preferred fragments include, for example, truncation polypeptides having a portion of the amino acid sequence of Table 1, or of variants thereof, such as a continuous series of residues that includes the amino terminus, or a continuous series of residues that includes the carboxyl terminus. Degradation forms of the polypeptides of the invention in a host cell, particularly a *Streptococcus pneumoniae*, are also preferred. Further preferred are fragments characterized by structural or functional attributes such as fragments that comprise alpha-helix and alpha-helix forming regions, beta-sheet and beta-sheet-forming regions, turn and turn-forming regions, coil

and coil-forming regions, hydrophilic regions, hydrophobic regions, alpha amphipathic regions, beta amphipathic regions, flexible regions, surface-forming regions, substrate binding region, and high antigenic index regions.

Also preferred are biologically active fragments which are those fragments that mediate activities of polypeptides of the invention, including those with a similar activity or an improved activity, or with a decreased undesirable activity. Also included are those fragments that are antigenic or immunogenic in an animal, especially in a human. Particularly preferred are fragments comprising receptors or domains of enzymes that confer a function essential for viability of *Streptococcus pneumoniae* or the ability to initiate, or maintain cause disease in an individual, particularly a human.

Variants that are fragments of the polypeptides of the invention may be employed for producing the corresponding full-length polypeptide by peptide synthesis; therefore, these variants may be employed as intermediates for producing the full-length polypeptides of the invention.

In addition to the standard single and triple letter representations for amino acids, the term "X" or "Xaa" is also used. "X" and "Xaa" mean that any of the twenty naturally occurring amino acids may appear at such a designated position in the polypeptide sequence.

Polynucleotides

The nucleotide sequences disclosed herein can be obtained by synthetic chemical techniques known in the art or can be obtained from *S. pneumoniae* 0100993 by probing a DNA preparation with probes constructed from the particular sequences disclosed herein. Alternatively, oligonucleotides derived from a disclosed sequence can act as PCR primers in a process of PCR-based cloning of the sequence from a bacterial genomic source. It is recognised that such sequences will also have utility in diagnosis of the stage of infection and type of infection the pathogen has attained.

To obtain the polynucleotide encoding the protein using the DNA sequence given herein typically a library of clones of chromosomal DNA of *S.pneumoniae* 0100993 in *E. coli* or some other suitable host is probed with a radiolabelled oligonucleotide, preferably a 17mer or longer, derived from the partial sequence. Clones carrying DNA identical to that of the probe can then be distinguished using high stringency washes. By sequencing the individual clones thus identified with sequencing primers designed from the original sequence it is then possible to extend the sequence in both directions to determine the full gene sequence. Conveniently such sequencing is performed using denatured double stranded DNA prepared from a plasmid clone. Suitable techniques are described by

Maniatis, T., Fritsch, E.F. and Sambrook, J. in MOLECULAR CLONING, A Laboratory Manual, 2nd edition, 1989, Cold Spring Harbor Laboratory (see: Screening By Hybridization 1.90 and Sequencing Denatured Double-Stranded DNA Templates 13.70).

Moreover, another aspect of the invention relates to isolated polynucleotides that encode the polypeptides of the invention having a deduced amino acid sequence selected from the group consisting of the sequences in Table 1 and polynucleotides closely related thereto and variants thereof.

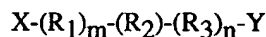
Using the information provided herein, such as the polynucleotide sequences set out in Table 1, a polynucleotide of the invention encoding polypeptide may be obtained using standard cloning and screening methods, such as those for cloning and sequencing chromosomal DNA fragments from bacteria using *Streptococcus pneumoniae* 0100993 cells as starting material, followed by obtaining a full length clone. For example, to obtain a polynucleotide sequence of the invention, such as a sequence set forth in Table 1, typically a library of clones of chromosomal DNA of *Streptococcus pneumoniae* 0100993 in *E.coli* or some other suitable host is probed with a radiolabeled oligonucleotide, preferably a 17-mer or longer, derived from a partial sequence. Clones carrying DNA identical to that of the probe can then be distinguished using stringent conditions. By sequencing the individual clones thus identified with sequencing primers designed from the original sequence it is then possible to extend the sequence in both directions to determine the full gene sequence. Conveniently, such sequencing is performed using denatured double stranded DNA prepared from a plasmid clone. Suitable techniques are described by Maniatis, T., Fritsch, E.F. and Sambrook et al., *MOLECULAR CLONING, A LABORATORY MANUAL*, 2nd Ed.; Cold Spring Harbor Laboratory Press, Cold Spring Harbor, New York (1989). (see in particular Screening By Hybridization 1.90 and Sequencing Denatured Double-Stranded DNA Templates 13.70). Illustrative of the invention, the polynucleotides set out in Table 1 were discovered in a DNA library derived from *Streptococcus pneumoniae* 0100993.

The DNA sequences set out in Table 1 each contains at least one open reading frame encoding a protein having at least about the number of amino acid residues set forth in Table 1. The start and stop codons of each open reading frame (herein "ORF") DNA are the first three and the last three nucleotides of each polynucleotide set forth in Table 1.

Certain polynucleotides and polypeptides of the invention are structurally related to known proteins as set forth in Table 1. These proteins exhibit greatest homology to the homologue listed in Table 1 from among the known proteins.

The invention provides a polynucleotide sequence identical over its entire length to each coding sequence in Table 1. Also provided by the invention is the coding sequence for the mature polypeptide or a fragment thereof, by itself as well as the coding sequence for the mature polypeptide or a fragment in reading frame with other coding sequence, such as those encoding a leader or secretory sequence, a pre-, or pro- or prepro- protein sequence. The polynucleotide may also contain non-coding sequences, including for example, but not limited to non-coding 5' and 3' sequences, such as the transcribed, non-translated sequences, termination signals, ribosome binding sites, sequences that stabilize mRNA, introns, polyadenylation signals, and additional coding sequence which encode additional amino acids. For example, a marker sequence that facilitates purification of the fused polypeptide can be encoded. In certain embodiments of the invention, the marker sequence is a hexa-histidine peptide, as provided in the pQE vector (Qiagen, Inc.) and described in Gentz *et al.*, *Proc. Natl. Acad. Sci., USA* 86: 821-824 (1989), or an HA tag (Wilson *et al.*, *Cell* 37: 767 (1984)). Polynucleotides of the invention also include, but are not limited to, polynucleotides comprising a structural gene and its naturally associated sequences that control gene expression.

The invention also includes polynucleotides of the formula:



wherein, at the 5' end of the molecule, X is hydrogen, and at the 3' end of the molecule, Y is hydrogen or a metal, R_1 and R_3 is any nucleic acid residue, n is an integer between 1 and 3000, m is an integer between 1 and 3000, and R_2 is a nucleic acid sequence of the invention, particularly a nucleic acid sequence selected from the group set forth in Table 1. In the polynucleotide formula above R_2 is oriented so that its 5' end residue is at the left, bound to R_1 , and its 3' end residue is at the right, bound to R_3 . Any stretch of nucleic acid residues denoted by either R group, where R is greater than 1, may be either a heteropolymer or a homopolymer, preferably a heteropolymer. In a preferred embodiment n is an integer between 1 and 1000, or 2000 or 3000.

The term "polynucleotide encoding a polypeptide" as used herein encompasses polynucleotides that include a sequence encoding a polypeptide of the invention, particularly a bacterial polypeptide and more particularly a polypeptide of the *Streptococcus pneumoniae* having an amino acid sequence set out in Table 1. The term also encompasses polynucleotides that include a single continuous region or discontinuous regions encoding the polypeptide (for example, interrupted by integrated phage or an insertion sequence or editing) together with additional regions, that also may contain coding and/or non-coding sequences.

The invention further relates to variants of the polynucleotides described herein that encode for variants of the polypeptide having the deduced amino acid sequence of Table 1. Variants that are fragments of the polynucleotides of the invention may be used to synthesize full-length polynucleotides of the invention.

Further particularly preferred embodiments are polynucleotides encoding polypeptide variants, that have the amino acid sequence of a polypeptide of Table 1 in which several, a few, 5 to 10, 1 to 5, 1 to 3, 2, 1 or no amino acid residues are substituted, deleted or added, in any combination. Especially preferred among these are silent substitutions, additions and deletions, that do not alter the properties and activities of such polynucleotide.

Further preferred embodiments of the invention are polynucleotides that are at least 50%, 60% or 70% identical over their entire length to a polynucleotide encoding a polypeptide having the amino acid sequence set out in Table 1, and polynucleotides that are complementary to such polynucleotides. Alternatively, most highly preferred are polynucleotides that comprise a region that is at least 80% identical over its entire length to a polynucleotide encoding a polypeptide of the deposited strain and polynucleotides complementary thereto. In this regard, polynucleotides at least 90% identical over their entire length to the same are particularly preferred, and among these particularly preferred polynucleotides, those with at least 95% are especially preferred. Furthermore, those with at least 97% are highly preferred among those with at least 95%, and among these those with at least 98% and at least 99% are particularly highly preferred, with at least 99% being the more preferred.

A preferred embodiment is an isolated polynucleotide comprising a polynucleotide sequence selected from the group consisting of: a polynucleotide having at least a 50% identity to a polynucleotide encoding a polypeptide comprising the amino acid sequence of Table 1 and obtained from a prokaryotic species other than *S. pneumoniae*; and a polynucleotide encoding a polypeptide comprising an amino acid sequence which is at least 50% identical to the amino acid sequence of Table 1 and obtained from a prokaryotic species other than *S. pneumoniae*.

Preferred embodiments are polynucleotides that encode polypeptides that retain substantially the same biological function or activity as the mature polypeptide encoded by the DNA of Table 1.

The invention further relates to polynucleotides that hybridize to the herein above-described sequences. In this regard, the invention especially relates to polynucleotides that hybridize under stringent conditions to the herein above-described polynucleotides. As herein used, the terms "stringent conditions" and "stringent hybridization conditions" mean hybridization will occur only if there is at least 95% and preferably at least 97% identity between

the sequences. An example of stringent hybridization conditions is overnight incubation at 42°C in a solution comprising: 50% formamide, 5x SSC (150mM NaCl, 15mM trisodium citrate), 50 mM sodium phosphate (pH7.6), 5x Denhardt's solution, 10% dextran sulfate, and 20 micrograms/ml denatured, sheared salmon sperm DNA, followed by washing the hybridization support in 0.1x SSC at about 65°C. Hybridization and wash conditions are well known and exemplified in Sambrook, *et al.*, Molecular Cloning: A Laboratory Manual, Second Edition, Cold Spring Harbor, N.Y., (1989), particularly Chapter 11 therein.

The invention also provides a polynucleotide consisting essentially of a polynucleotide sequence obtainable by screening an appropriate library containing the complete gene for a polynucleotide sequence set forth in Table 1 under stringent hybridization conditions with a probe having the sequence of said polynucleotide sequence or a fragment thereof; and isolating said DNA sequence. Fragments useful for obtaining such a polynucleotide include, for example, probes and primers described elsewhere herein.

As discussed additionally herein regarding polynucleotide assays of the invention, for instance, polynucleotides of the invention as discussed above, may be used as a hybridization probe for RNA, cDNA and genomic DNA to isolate full-length cDNAs and genomic clones encoding a polypeptide and to isolate cDNA and genomic clones of other genes that have a high sequence similarity to a polynucleotide set forth in Table 1. Such probes generally will comprise at least 15 bases. Preferably, such probes will have at least 30 bases and may have at least 50 bases. Particularly preferred probes will have at least 30 bases and will have 50 bases or less.

For example, the coding region of each gene that comprises or is comprised by a polynucleotide set forth in Table 1 may be isolated by screening using a DNA sequence provided in Table 1 to synthesize an oligonucleotide probe. A labeled oligonucleotide having a sequence complementary to that of a gene of the invention is then used to screen a library of cDNA, genomic DNA or mRNA to determine which members of the library the probe hybridizes to.

The polynucleotides and polypeptides of the invention may be employed, for example, as research reagents and materials for discovery of treatments of and diagnostics for disease, particularly human disease, as further discussed herein relating to polynucleotide assays.

Polynucleotides of the invention that are oligonucleotides derived from the a polynucleotide or polypeptide sequence set forth in Table 1 may be used in the processes herein as described, but preferably for PCR, to determine whether or not the polynucleotides identified herein in whole or in part are transcribed in bacteria in infected tissue. It is recognized that such sequences will also have utility in diagnosis of the stage of infection and type of infection the pathogen has attained.

The invention also provides polynucleotides that may encode a polypeptide that is the mature protein plus additional amino or carboxyl-terminal amino acids, or amino acids interior to the mature polypeptide (when the mature form has more than one polypeptide chain, for instance). Such sequences may play a role in processing of a protein from precursor to a mature form, may allow protein transport, may lengthen or shorten protein half-life or may facilitate manipulation of a protein for assay or production, among other things. As generally is the case *in vivo*, the additional amino acids may be processed away from the mature protein by cellular enzymes.

A precursor protein, having the mature form of the polypeptide fused to one or more prosequences may be an inactive form of the polypeptide. When prosequences are removed such inactive precursors generally are activated. Some or all of the prosequences may be removed before activation. Generally, such precursors are called proproteins.

In addition to the standard A, G, C, T/U representations for nucleic acid bases, the term "N" is also used. "N" means that any of the four DNA or RNA bases may appear at such a designated position in the DNA or RNA sequence, except it is preferred that N is not a base that when taken in combination with adjacent nucleotide positions, when read in the correct reading frame, would have the effect of generating a premature termination codon in such reading frame.

In sum, a polynucleotide of the invention may encode a mature protein, a mature protein plus a leader sequence (which may be referred to as a preprotein), a precursor of a mature protein having one or more prosequences that are not the leader sequences of a preprotein, or a preproprotein, which is a precursor to a proprotein, having a leader sequence and one or more prosequences, which generally are removed during processing steps that produce active and mature forms of the polypeptide.

Vectors, host cells, expression

The invention also relates to vectors that comprise a polynucleotide or polynucleotides of the invention, host cells that are genetically engineered with vectors of the invention and the production of polypeptides of the invention by recombinant techniques. Cell-free translation systems can also be employed to produce such proteins using RNAs derived from the DNA constructs of the invention.

For recombinant production, host cells can be genetically engineered to incorporate expression systems or portions thereof or polynucleotides of the invention. Introduction of a polynucleotide into the host cell can be effected by methods described in many standard laboratory manuals, such as Davis et al., *BASIC METHODS IN MOLECULAR BIOLOGY*,

(1986) and Sambrook et al., *MOLECULAR CLONING: A LABORATORY MANUAL*, 2nd Ed., Cold Spring Harbor Laboratory Press, Cold Spring Harbor, N.Y. (1989), such as, calcium phosphate transfection, DEAE-dextran mediated transfection, transvection, microinjection, cationic lipid-mediated transfection, electroporation, transduction, scrape loading, ballistic introduction and infection.

Representative examples of appropriate hosts include bacterial cells, such as streptococci, staphylococci, enterococci *E. coli*, streptomyces and *Bacillus subtilis* cells; fungal cells, such as yeast cells and *Aspergillus* cells; insect cells such as *Drosophila* S2 and *Spodoptera* Sf9 cells; animal cells such as CHO, COS, HeLa, C127, 3T3, BHK, 293 and Bowes melanoma cells; and plant cells.

A great variety of expression systems can be used to produce the polypeptides of the invention. Such vectors include, among others, chromosomal, episomal and virus-derived vectors, *e.g.*, vectors derived from bacterial plasmids, from bacteriophage, from transposons, from yeast episomes, from insertion elements, from yeast chromosomal elements, from viruses such as baculoviruses, papova viruses, such as SV40, vaccinia viruses, adenoviruses, fowl pox viruses, pseudorabies viruses and retroviruses, and vectors derived from combinations thereof, such as those derived from plasmid and bacteriophage genetic elements, such as cosmids and phagemids. The expression system constructs may contain control regions that regulate as well as engender expression. Generally, any system or vector suitable to maintain, propagate or express polynucleotides and/or to express a polypeptide in a host may be used for expression in this regard. The appropriate DNA sequence may be inserted into the expression system by any of a variety of well-known and routine techniques, such as, for example, those set forth in Sambrook *et al.*, *MOLECULAR CLONING, A LABORATORY MANUAL*, (*supra*).

For secretion of the translated protein into the lumen of the endoplasmic reticulum, into the periplasmic space or into the extracellular environment, appropriate secretion signals may be incorporated into the expressed polypeptide. These signals may be endogenous to the polypeptide or they may be heterologous signals.

Polypeptides of the invention can be recovered and purified from recombinant cell cultures by well-known methods including ammonium sulfate or ethanol precipitation, acid extraction, anion or cation exchange chromatography, phosphocellulose chromatography, hydrophobic interaction chromatography, affinity chromatography, hydroxylapatite chromatography, and lectin chromatography. Most preferably, high performance liquid chromatography is employed for purification. Well known techniques for refolding protein may

be employed to regenerate active conformation when the polypeptide is denatured during isolation and or purification.

Diagnostic Assays

This invention is also related to the use of the polynucleotides of the invention for use as diagnostic reagents. Detection of such polynucleotides in a eukaryote, particularly a mammal, and especially a human, will provide a diagnostic method for diagnosis of a disease. Eukaryotes (herein also "individual(s)"), particularly mammals, and especially humans, infected with an organism comprising a gene of the invention may be detected at the nucleic acid level by a variety of techniques.

Nucleic acids for diagnosis may be obtained from an infected individual's cells and tissues, such as bone, blood, muscle, cartilage, and skin. Genomic DNA may be used directly for detection or may be amplified enzymatically by using PCR or other amplification technique prior to analysis. RNA or cDNA may also be used in the same ways. Using amplification, characterization of the species and strain of prokaryote present in an individual, may be made by an analysis of the genotype of the prokaryote gene. Deletions and insertions can be detected by a change in size of the amplified product in comparison to the genotype of a reference sequence. Point mutations can be identified by hybridizing amplified DNA to labeled polynucleotide sequences of the invention. Perfectly matched sequences can be distinguished from mismatched duplexes by RNase digestion or by differences in melting temperatures. DNA sequence differences may also be detected by alterations in the electrophoretic mobility of the DNA fragments in gels, with or without denaturing agents, or by direct DNA sequencing. See, *e.g.*, Myers et al., *Science*, 230: 1242 (1985). Sequence changes at specific locations also may be revealed by nuclease protection assays, such as RNase and S1 protection or a chemical cleavage method. See, *e.g.*, Cotton et al., *Proc. Natl. Acad. Sci., USA*, 85: 4397-4401 (1985).

Cells carrying mutations or polymorphisms in the gene of the invention may also be detected at the DNA level by a variety of techniques, to allow for serotyping, for example. For example, RT-PCR can be used to detect mutations. It is particularly preferred to use RT-PCR in conjunction with automated detection systems, such as, for example, GeneScan. RNA or cDNA may also be used for the same purpose, PCR or RT-PCR. As an example, PCR primers complementary to a nucleic acid encoding a polypeptide of the invention can be used to identify and analyze mutations. These primers may be used for, among other things, amplifying a DNA of the invention isolated from a sample derived from an individual. The primers may be used to amplify the gene isolated from an infected individual such that the gene may then be subject to

various techniques for elucidation of the DNA sequence. In this way, mutations in the DNA sequence may be detected and used to diagnose infection and to serotype and/or classify the infectious agent.

The invention further provides a process for diagnosing disease, preferably bacterial infections, more preferably infections by *Streptococcus pneumoniae*, and most preferably disease, comprising determining from a sample derived from an individual a increased level of expression of polynucleotide having the sequence of Table 1. Increased or decreased expression of a polynucleotide of the invention can be measured using any on of the methods well known in the art for the quantitation of polynucleotides, such as, for example, amplification, PCR, RT-PCR, RNase protection, Northern blotting and other hybridization methods.

In addition, a diagnostic assay in accordance with the invention for detecting over-expression of a polypeptide of the invention compared to normal control tissue samples may be used to detect the presence of an infection, for example. Assay techniques that can be used to determine levels of a protein, in a sample derived from a host are well-known to those of skill in the art. Such assay methods include radioimmunoassays, competitive-binding assays, Western Blot analysis and ELISA assays.

Antibodies

The polypeptides of the invention or variants thereof, or cells expressing them can be used as an immunogen to produce antibodies immunospecific for such polypeptides. "Antibodies" as used herein includes monoclonal and polyclonal antibodies, chimeric, single chain, simianized antibodies and humanized antibodies, as well as Fab fragments, including the products of an Fab immunoglobulin expression library.

Antibodies generated against the polypeptides of the invention can be obtained by administering the polypeptides or epitope-bearing fragments, analogues or cells to an animal, preferably a nonhuman, using routine protocols. For preparation of monoclonal antibodies, any technique known in the art that provides antibodies produced by continuous cell line cultures can be used. Examples include various techniques, such as those in Kohler, G. and Milstein, C., *Nature* 256: 495-497 (1975); Kozbor *et al.*, *Immunology Today* 4: 72 (1983); Cole *et al.*, pg. 77-96 in *MONOCLONAL ANTIBODIES AND CANCER THERAPY*, Alan R. Liss, Inc. (1985).

Techniques for the production of single chain antibodies (U.S. Patent No. 4,946,778) can be adapted to produce single chain antibodies to polypeptides of this invention. Also, transgenic mice, or other organisms such as other mammals, may be used to express humanized antibodies.

Alternatively phage display technology may be utilized to select antibody genes with binding activities towards the polypeptide either from repertoires of PCR amplified v-genes of lymphocytes from humans screened for possessing recognition of a polypeptide of the invention or from naive libraries (McCafferty, J. et al., (1990), *Nature* **348**, 552-554; Marks, J. et al., (1992) *Biotechnology* **10**, 779-783). The affinity of these antibodies can also be improved by chain shuffling (Clackson, T. et al., (1991) *Nature* **352**, 624-628).

If two antigen binding domains are present each domain may be directed against a different epitope - termed 'bispecific' antibodies.

The above-described antibodies may be employed to isolate or to identify clones expressing the polypeptides to purify the polypeptides by affinity chromatography.

Thus, among others, antibodies against a polypeptide of the invention may be employed to treat disease.

Polypeptide variants include antigenically, epitopically or immunologically equivalent variants that form a particular aspect of this invention. The term "antigenically equivalent derivative" as used herein encompasses a polypeptide or its equivalent which will be specifically recognized by certain antibodies which, when raised to the protein or polypeptide according to the invention, interfere with the immediate physical interaction between pathogen and mammalian host. The term "immunologically equivalent derivative" as used herein encompasses a peptide or its equivalent which when used in a suitable formulation to raise antibodies in a vertebrate, the antibodies act to interfere with the immediate physical interaction between pathogen and mammalian host.

The polypeptide, such as an antigenically or immunologically equivalent derivative or a fusion protein thereof is used as an antigen to immunize a mouse or other animal such as a rat or chicken. The fusion protein may provide stability to the polypeptide. The antigen may be associated, for example by conjugation, with an immunogenic carrier protein for example bovine serum albumin (BSA) or keyhole limpet haemocyanin (KLH). Alternatively a multiple antigenic peptide comprising multiple copies of the protein or polypeptide, or an antigenically or immunologically equivalent polypeptide thereof may be sufficiently antigenic to improve immunogenicity so as to obviate the use of a carrier.

Preferably, the antibody or variant thereof is modified to make it less immunogenic in the individual. For example, if the individual is human the antibody may most preferably be "humanized"; where the complementarity determining region(s) of the hybridoma-derived antibody has been transplanted into a human monoclonal antibody, for

example as described in Jones, P. et al. (1986), *Nature* 321, 522-525 or Tempest et al., (1991) *Biotechnology* 9, 266-273.

The use of a polynucleotide of the invention in genetic immunization will preferably employ a suitable delivery method such as direct injection of plasmid DNA into muscles (Wolff et al., *Hum Mol Genet* 1992, 1:363, Manthorpe et al., *Hum. Gene Ther.* 1993:4, 419), delivery of DNA complexed with specific protein carriers (Wu et al., *J Biol Chem.* 1989: 264,16985), coprecipitation of DNA with calcium phosphate (Benvenisty & Reshef, *PNAS*, 1986:83,9551), encapsulation of DNA in various forms of liposomes (Kaneda et al., *Science* 1989:243,375), particle bombardment (Tang et al., *Nature* 1992, 356:152, Eisenbraun et al., *DNA Cell Biol* 1993, 12:791) and *in vivo* infection using cloned retroviral vectors (Seeger et al., *PNAS* 1984:81,5849).

Antagonists and agonists - assays and molecules

Polypeptides of the invention may also be used to assess the binding of small molecule substrates and ligands in, for example, cells, cell-free preparations, chemical libraries, and natural product mixtures. These substrates and ligands may be natural substrates and ligands or may be structural or functional mimetics. See, e.g., Coligan et al., *Current Protocols in Immunology* 1(2): Chapter 5 (1991).

The invention also provides a method of screening compounds to identify those which enhance (agonist) or block (antagonist) the action of a polypeptides or polynucleotides of the invention, particularly those compounds that are bacteriostatic and/or bacteriocidal. The method of screening may involve high-throughput techniques. For example, to screen for agonists or antagonists, a synthetic reaction mix, a cellular compartment, such as a membrane, cell envelope or cell wall, or a preparation of any thereof, comprising a polypeptide of the invention and a labeled substrate or ligand of such polypeptide is incubated in the absence or the presence of a candidate molecule that may be an agonist or antagonist of a polypeptide of the invention. The ability of the candidate molecule to agonize or antagonize a polypeptide of the invention is reflected in decreased binding of the labeled ligand or decreased production of product from such substrate. Molecules that bind gratuitously, *i.e.*, without inducing the effects of a polypeptide of the invention are most likely to be good antagonists. Molecules that bind well and increase the rate of product production from substrate are agonists. Detection of the rate or level of production of product from substrate may be enhanced by using a reporter system. Reporter systems that may be useful in this regard include but are not limited to colorimetric labeled substrate converted into product, a reporter gene that is responsive to changes in polynucleotide or polypeptide activity, and binding assays known in the art.

Another example of an assay for antagonists of polypeptides of the invention is a competitive assay that combines any such polypeptide and a potential antagonist with a compound which binds such polypeptide, natural substrates or ligands, or substrate or ligand mimetics, under appropriate conditions for a competitive inhibition assay. A polypeptide of the invention can be labeled, such as by radioactivity or a colorimetric compound, such that the number of such polypeptide molecules bound to a binding molecule or converted to product can be determined accurately to assess the effectiveness of the potential antagonist.

Potential antagonists include small organic molecules, peptides, polypeptides and antibodies that bind to a polynucleotide or polypeptide of the invention and thereby inhibit or extinguish its activity. Potential antagonists also may be small organic molecules, a peptide, a polypeptide such as a closely related protein or antibody that binds the same sites on a binding molecule, such as a binding molecule, without inducing activities induced by a polypeptide of the invention, thereby preventing the action of such polypeptide by excluding it from binding.

Potential antagonists include a small molecule that binds to and occupies the binding site of the polypeptide thereby preventing binding to cellular binding molecules, such that normal biological activity is prevented. Examples of small molecules include but are not limited to small organic molecules, peptides or peptide-like molecules. Other potential antagonists include antisense molecules (see Okano, *J. Neurochem.* 56: 560 (1991); *OLIGODEOXYNUCLEOTIDES AS ANTISENSE INHIBITORS OF GENE EXPRESSION*, CRC Press, Boca Raton, FL (1988), for a description of these molecules). Preferred potential antagonists include compounds related to and variants of a polypeptide of the invention.

Each of the DNA sequences provided herein may be used in the discovery and development of antibacterial compounds. The encoded protein, upon expression, can be used as a target for the screening of antibacterial drugs. Additionally, the DNA sequences encoding the amino terminal regions of the encoded protein or Shine-Delgarno or other translation facilitating sequences of the respective mRNA can be used to construct antisense sequences to control the expression of the coding sequence of interest.

The invention also provides the use of the polypeptide, polynucleotide or inhibitor of the invention to interfere with the initial physical interaction between a pathogen and mammalian host responsible for sequelae of infection. In particular the molecules of the invention may be used: in the prevention of adhesion of bacteria, in particular gram positive bacteria, to mammalian extracellular matrix proteins on in-dwelling devices or to extracellular matrix proteins in wounds; to block protein-mediated mammalian cell invasion by, for example, initiating phosphorylation of mammalian tyrosine kinases (Rosenshine *et*

al., *Infect. Immun.* 60:2211 (1992); to block bacterial adhesion between mammalian extracellular matrix proteins and bacterial proteins that mediate tissue damage and; to block the normal progression of pathogenesis in infections initiated other than by the implantation of in-dwelling devices or by other surgical techniques.

The antagonists and agonists of the invention may be employed, for instance, to inhibit and treat disease.

Helicobacter pylori (herein *H. pylori*) bacteria infect the stomachs of over one-third of the world's population causing stomach cancer, ulcers, and gastritis (International Agency for Research on Cancer (1994) Schistosomes, Liver Flukes and Helicobacter Pylori (International Agency for Research on Cancer, Lyon, France; <http://www.uicc.ch/ecp/ecp2904.htm>). Moreover, the international Agency for Research on Cancer recently recognized a cause-and-effect relationship between *H. pylori* and gastric adenocarcinoma, classifying the bacterium as a Group I (definite) carcinogen. Preferred antimicrobial compounds of the invention found using screens provided by the invention, particularly broad-spectrum antibiotics, should be useful in the treatment of *H. pylori* infection. Such treatment should decrease the advent of *H. pylori*-induced cancers, such as gastrointestinal carcinoma. Such treatment should also cure gastric ulcers and gastritis.

Vaccines

Another aspect of the invention relates to a method for inducing an immunological response in an individual, particularly a mammal which comprises inoculating the individual with a polypeptide of the invention, or a fragment or variant thereof, adequate to produce antibody and/ or T cell immune response to protect said individual from infection, particularly bacterial infection and most particularly *Streptococcus pneumoniae* infection. Also provided are methods whereby such immunological response slows bacterial replication. Yet another aspect of the invention relates to a method of inducing immunological response in an individual which comprises delivering to such individual a nucleic acid vector to direct expression of a polynucleotide or polypeptide of the invention, or a fragment or a variant thereof, for expressing such polynucleotide or polypeptide, or a fragment or a variant thereof *in vivo* in order to induce an immunological response, such as, to produce antibody and/ or T cell immune response, including, for example, cytokine-producing T cells or cytotoxic T cells, to protect said individual from disease, whether that disease is already established within the individual or not. One way of administering the gene is by accelerating it into the desired cells as a coating on particles or otherwise. Such

nucleic acid vector may comprise DNA, RNA, a modified nucleic acid, or a DNA/RNA hybrid.

A further aspect of the invention relates to an immunological composition which, when introduced into an individual capable or having induced within it an immunological response, induces an immunological response in such individual to a polynucleotide of the invention or protein coded therefrom, wherein the composition comprises a recombinant polynucleotide or protein coded therefrom comprising DNA which codes for and expresses an antigen of said polynucleotide or protein coded therefrom. The immunological response may be used therapeutically or prophylactically and may take the form of antibody immunity or cellular immunity such as that arising from CTL or CD4+ T cells.

A polypeptide of the invention or a fragment thereof may be fused with co-protein which may not by itself produce antibodies, but is capable of stabilizing the first protein and producing a fused protein which will have immunogenic and protective properties. Thus fused recombinant protein, preferably further comprises an antigenic co-protein, such as lipoprotein D from *Hemophilus influenzae*, Glutathione-S-transferase (GST) or beta-galactosidase, relatively large co-proteins which solubilize the protein and facilitate production and purification thereof. Moreover, the co-protein may act as an adjuvant in the sense of providing a generalized stimulation of the immune system. The co-protein may be attached to either the amino or carboxy terminus of the first protein.

Provided by this invention are compositions, particularly vaccine compositions, and methods comprising the polypeptides or polynucleotides of the invention and immunostimulatory DNA sequences, such as those described in Sato, Y. *et al.* Science 273: 352 (1996).

Also, provided by this invention are methods using the described polynucleotide or particular fragments thereof which have been shown to encode non-variable regions of bacterial cell surface proteins in DNA constructs used in such genetic immunization experiments in animal models of infection with *Streptococcus pneumoniae* will be particularly useful for identifying protein epitopes able to provoke a prophylactic or therapeutic immune response. It is believed that this approach will allow for the subsequent preparation of monoclonal antibodies of particular value from the requisite organ of the animal successfully resisting or clearing infection for the development of prophylactic agents or therapeutic treatments of bacterial infection, particularly *Streptococcus pneumoniae* infection, in mammals, particularly humans.

The polypeptide may be used as an antigen for vaccination of a host to produce specific antibodies which protect against invasion of bacteria, for example by blocking adherence of bacteria to damaged tissue. Examples of tissue damage include wounds in skin or connective tissue caused, e.g., by mechanical, chemical or thermal damage or by implantation of indwelling devices, or wounds in the mucous membranes, such as the mouth, mammary glands, urethra or vagina.

The invention also includes a vaccine formulation which comprises an immunogenic recombinant protein of the invention together with a suitable carrier. Since the protein may be broken down in the stomach, it is preferably administered parenterally, including, for example, administration that is subcutaneous, intramuscular, intravenous, or intradermal. Formulations suitable for parenteral administration include aqueous and non-aqueous sterile injection solutions which may contain anti-oxidants, buffers, bacteriostats and solutes which render the formulation isotonic with the bodily fluid, preferably the blood, of the individual; and aqueous and non-aqueous sterile suspensions which may include suspending agents or thickening agents. The formulations may be presented in unit-dose or multi-dose containers, for example, sealed ampules and vials and may be stored in a freeze-dried condition requiring only the addition of the sterile liquid carrier immediately prior to use. The vaccine formulation may also include adjuvant systems for enhancing the immunogenicity of the formulation, such as oil-in water systems and other systems known in the art. The dosage will depend on the specific activity of the vaccine and can be readily determined by routine experimentation.

While the invention has been described with reference to certain protein, such as, for example, those set forth in Table 1, it is to be understood that this covers fragments of the naturally occurring protein and similar proteins with additions, deletions or substitutions which do not substantially affect the immunogenic properties of the recombinant protein.

Compositions, kits and administration

The invention also relates to compositions comprising the polynucleotide or the polypeptides discussed above or their agonists or antagonists. The polypeptides of the invention may be employed in combination with a non-sterile or sterile carrier or carriers for use with cells, tissues or organisms, such as a pharmaceutical carrier suitable for administration to a subject. Such compositions comprise, for instance, a media additive or a therapeutically effective amount of a polypeptide of the invention and a pharmaceutically acceptable carrier or excipient. Such carriers may include, but are not limited to, saline, buffered saline, dextrose, water, glycerol, ethanol and combinations thereof. The formulation should suit the mode of administration. The

invention further relates to diagnostic and pharmaceutical packs and kits comprising one or more containers filled with one or more of the ingredients of the aforementioned compositions of the invention.

Polypeptides and other compounds of the invention may be employed alone or in conjunction with other compounds, such as therapeutic compounds.

The pharmaceutical compositions may be administered in any effective, convenient manner including, for instance, administration by topical, oral, anal, vaginal, intravenous, intraperitoneal, intramuscular, subcutaneous, intranasal or intradermal routes among others.

In therapy or as a prophylactic, the active agent may be administered to an individual as an injectable composition, for example as a sterile aqueous dispersion, preferably isotonic.

Alternatively the composition may be formulated for topical application for example in the form of ointments, creams, lotions, eye ointments, eye drops, ear drops, mouthwash, impregnated dressings and sutures and aerosols, and may contain appropriate conventional additives, including, for example, preservatives, solvents to assist drug penetration, and emollients in ointments and creams. Such topical formulations may also contain compatible conventional carriers, for example cream or ointment bases, and ethanol or oleyl alcohol for lotions. Such carriers may constitute from about 1% to about 98% by weight of the formulation; more usually they will constitute up to about 80% by weight of the formulation.

For administration to mammals, and particularly humans, it is expected that the daily dosage level of the active agent will be from 0.01 mg/kg to 10 mg/kg, typically around 1 mg/kg. The physician in any event will determine the actual dosage which will be most suitable for an individual and will vary with the age, weight and response of the particular individual. The above dosages are exemplary of the average case. There can, of course, be individual instances where higher or lower dosage ranges are merited, and such are within the scope of this invention.

In-dwelling devices include surgical implants, prosthetic devices and catheters, i.e., devices that are introduced to the body of an individual and remain in position for an extended time. Such devices include, for example, artificial joints, heart valves, pacemakers, vascular grafts, vascular catheters, cerebrospinal fluid shunts, urinary catheters, continuous ambulatory peritoneal dialysis (CAPD) catheters.

The composition of the invention may be administered by injection to achieve a systemic effect against relevant bacteria shortly before insertion of an in-dwelling device.

Treatment may be continued after surgery during the in-body time of the device. In addition, the composition could also be used to broaden perioperative cover for any surgical technique to prevent bacterial wound infections, especially *Streptococcus pneumoniae* wound infections.

Many orthopedic surgeons consider that humans with prosthetic joints should be considered for antibiotic prophylaxis before dental treatment that could produce a bacteremia. Late deep infection is a serious complication sometimes leading to loss of the prosthetic joint and is accompanied by significant morbidity and mortality. It may therefore be possible to extend the use of the active agent as a replacement for prophylactic antibiotics in this situation.

In addition to the therapy described above, the compositions of this invention may be used generally as a wound treatment agent to prevent adhesion of bacteria to matrix proteins exposed in wound tissue and for prophylactic use in dental treatment as an alternative to, or in conjunction with, antibiotic prophylaxis.

Alternatively, the composition of the invention may be used to bathe an indwelling device immediately before insertion. The active agent will preferably be present at a concentration of 1µg/ml to 10mg/ml for bathing of wounds or indwelling devices.

A vaccine composition is conveniently in injectable form. Conventional adjuvants may be employed to enhance the immune response. A suitable unit dose for vaccination is 0.5-5 microgram/kg of antigen, and such dose is preferably administered 1-3 times and with an interval of 1-3 weeks. With the indicated dose range, no adverse toxicological effects will be observed with the compounds of the invention which would preclude their administration to suitable individuals.

Each reference disclosed herein is incorporated by reference herein in its entirety. Any patent application to which this application claims priority is also incorporated by reference herein in its entirety.

TABLES

Certain pertinent data for preferred polypeptide and polynucleotide embodiments of the invention are summarized in Tables 1 and 2.

Provided in Table 1 are sequence search results providing characterization information regarding certain preferred polynucleotides (denoted as "Assembly") and polypeptides of the invention encoded thereby. For each polynucleotide in Table 1, there is listed the closest homologue of each polypeptide encoded by each ORF in such polynucleotide. This determination of homology is based on a comparison of the sequences

of in Table 1 with sequences available in the public domain (see heading entitled "Description" for the homologue name). Where no significant homologue was detected the term "unknown" appears after the heading "Description". Preferred polypeptides encoded by the ORFs of the invention, particularly full length proteins either obtained using such ORFs or encoded entirely by such ORFs, are ones that have a biological function of the homologue listed, among other functions. The analysis used to determine each homologue listed in Table 1 was either BlastP and/or BlastX and/or MPSearch, each of which is well known. Also provided in Table 1 is the amino acid sequence encoded by each ORF. An "Assembly ID" number provides a convenient way to correlate the polynucleotide sequence with the ORF or ORFs it comprises and the polypeptides encoded by these ORFs, as well as to correlate such sequences with other pertinent information provided in Tables 1 and 2. Following the heading "ORF Predictions" the nucleotides at the beginning and end of the ORF sequence are set forth ("Start" and "End" respectively). The direction of translation on the polynucleotide depicted is denoted by an "F" for forward or an "R" for reverse (reverse being translated on the opposite strand from the one depicted). The length of each amino acid sequence is also indicated in a column entitled "Length." Below these data is shown the amino acid sequence encoded by the ORF. If a given polynucleotide comprises one ORF, then in the column entitled "ORF #" there is the numeral one. If it encodes two, there are the numerals one and two in the column, and so on.

TABLE 1

Assembly ID: 3047950

Assembly Length: 587bp

```
[SEQ ID NO:      ] 3047950 Strep Assembly -- Assembly
id#3047950
CTCAGTTCTTGCCATCCTTCTTCCTCGCTTTTTTGATGAAACTGCCCTTCATATCTACAC
GCTTGTCCAGATAGCGATAAACGCGCTGATATCCATCTCCCATGAAATAGGTTGGGGCAA
ACAGTTGATTTTTAAATGTCCCTTTTCATCCAGGAATTCTGGGGCAACAAGTCGCTCAA
GAATCTTGGCAAAGATGTGGCAAATACCGTCTTCCTCAACAATCCTATCTACCCGACAAT
CTAAAACAAGTGGACAGGCGTCTAAAATAGAAATCTGAGTTCGTTGAGAAATTTATAAT
GCACTCCCAAACGTTCCAATTTCTCCTGATGACTGATAAAACCAGCCTGCTCCATCGCAA
GCATAGAAGTTTCATCAGAAATATTCACAGTAAATTTTGATACTGTTTGATCTGCTCTG
CGGCATTCTCTCTCGCAACGACTCCAATCACAACCCAATCTCCTAGACTATAAGAAGAAC
TACAGGTCGTGATGTTATAGCCAAAATTCTAATCTTGATATCCTAAAAATAAAACAGGAA
AACCATAATATAGTTTACTTGTGTTAAAGATTGCTTCATAACAACC
```

ORF Predictions:

ORF #	Start	End	Direction	Length
6	2	451	R	150 aa

[SEQ ID NO:] 3047950-6 ORF translation from 2-451,
direction R

VIGVVARENAAEQIKQYQKFTVNISDETSMLAMEQAGFISHQEKLERLGVHYEISERTQI
SILDACPLVLDCRVDRIVEEDGICHIFAKILERLVAPEFLDEKGFKNQLFAPTYFMGDG
YQRVYRYLDRVDMKGSFIKKARKKDGKN*

Blastp and/or MPSearch Result:

Description:
unknown

Assembly ID: 3049152
Assembly Length: 468bp

[SEQ ID NO:] 3049152 Strep Assembly -- Assembly
id#3049152

CTTCCTAGTTTGCTCTTTGATTTTCATTGACTATAAATGGTTTTAATTCTTTTTTTCAAA
TCTGGCACTACTTCTGCCTCAAACCAAGGATTTTTGGCCATCCAGATTTGATTTTCGTGGT
GATGGGTGAAGTAGCGGAAAATAGGCTGGCAGATAGTCTTTATAGTGTTTCACCCTCTCC
GTTACCTTCCCACTGATTTTCTCCTGTAAATAGTAGGCTTGGGCATATTGCCCAATCAAG
AGGGTTAACTGAATATCAGGCAATTCCTGTAAAGAGCTGCGGATGCCATTTTCTGCAAAA
CCTGTACGAGGCGGAAGATCACCCGACTTGCCATGTCCCTGGAAAGTTAGAAATCCATAGG
CAAAACAGCAAAATAACCTGAATTGTAAAAGGTATCTTCATCCACACCTAGCCAGTCCCC
GCAAGCGGTCACCACTTTTATCTTTCCAGTAAGCCTGCTTCCTTGATT

ORF Predictions:

ORF #	Start	End	Direction	Length
				33

 6 24 407 R 128 aa

[SEQ ID NO:] 3049152-6 ORF translation from 24-407,
 direction R
 VWMKIPFTIQVILLFCLWISNFPBGHGKSGDLPPRTGFAEKWHPQLLQELPDIQLTLLIGQ
 YAQAYYLQEKISGKVTERVKHYKDYLPAFYPLVHPSRNQIWMAKNPWFEEVVPDLKKR
 IKTIYSQ*

Blastp and/or MPSearch Result:

Description:
 unknown

Assembly ID: 3174820
 Assembly Length: 1086bp

[SEQ ID NO:] 3174820 Strep Assembly -- Assembly
 id#3174820
 CTACCTTGCTAGATGTGATAGACCGTGGGAATGTCTCTATCATTTTCAGAAGGAGATGCAG
 TTGGTTTGAGGCTAGTAAAAGAAGATGGTTTGTCAAGCTTTGAGAAAGACTGCCTAAATC
 TAGCTTTTTTCAGGTAAAAAGAAGAACTCTTTCCAATTTGTTTGC GGATTACAAGGTAT
 CTGATAGTCTTTATCGTAGAGCCAAAGTTTCTGATGAAAAACGGATTCAAGCAAGAGGGC
 TTCAACTCAAATCTTCTTTTGAAGAGGTATTGAACCAGATGCAAGAAGGAGTGAGAAAAC
 GAGTTTCCTTCTGGGGGCTCCCAGATTACTATCGTCCTTTAACTGGTTTGGAAAAGGCTT
 TGCAAGTGGGTATGGGTGTCTTGACTATCTTGCCCCCTATTTATCGGATTTGGTTTGTCT
 TGTACAGTTTAGACGTTTCATGGCTATCTTTACCTCCCTTTGCCAATACTTGGTTTTC TAG
 GGTTAGTTTTGTCTGTTTTCTATTATTGGAAGCTTCGACTAGATAATCGTGATGGTGTTT
 TAAATGAAGCGGGAGCTGAGGTCTACTATCTCTGGACCAGTTTGGAAAATATGTTACGTG
 AGATTGCACGACTGGATAAGGCTGAATTGCGAAAGTATTGTTGTTTGGGAATCGTCTCTTG
 GTCTATGCAACCTTATTTGGCTATGCGGACAAGGTTAGTCATTTGATGAAGGTTTCATCAG
 ATTTCAAGTTGAAAATCCAGATATCAATCTCTATGTAGCTTATGGCTGGCACAGTATGTTT
 TATCATTTCAAGCGCGCAAATGAGCCATTATGCTAGTGTGCGAAATACAGCAAGTACCTAC
 TCCGTATCTTCTGGAAGTGGAAGTCTGGTGGTGGCTTCTCTGGAGGCGGAGGTGGCGGCA
 GTATCGGTGCCTTTTAAAGAGAGCTACCATACACTGAAAAAGTATGATATATGGAAGATA
 GAAAAAGACACCTATANGAAAATCATAGTTTTATCTAAACTATTTCTTATTTCCATTGAT
 GATTTTGGCGAAGAATTTTAGAACCCGGCAAAAAGCCCTTGAAAAATTCCATTTTCCAA

AGGTAA

ORF Predictions:

ORF #	Start	End	Direction	Length
7	598	1041	F	148 aa

[SEQ ID NO:] 3174820-7 ORF translation from 598-1041,
direction F
VRLHDWIRLNCESIVVWNRLLVYATLFGYADKVSHLMKVHQIQVENPDINLYVAYGWHSM
FYHSSAQMSHYASVANTASTYSVSSGSGSLVVASLEAEVAASVSPFKESYHTLKKYDIWK
IEKDTYXKIIIVLSKLFLISIDDFGEEF*

Blastp and/or MPSearch Result:

Description:

unknown

Assembly ID: 3175500
Assembly Length: 1284bp

[SEQ ID NO:] 3175500 Strep Assembly -- Assembly
id#3175500
CTCATTTGCAAAATCAGGAAAAACGGATGGTAACGGCAGTCCGAAATGTTCTATCTAAGA
AACAAGAGGCTTTGAAAAAATGCAGTCAGTCTGTTATCTTTAGACAACCTGAGCGCTTGT
ATGACGGTTATTTGCAACGCTTGGACCAACTGCAACTGCGTTTGAAACAAAGTTTGCGAA
CTCGGATTTCTGATAACAAACAATTAGTTCAAGCAAGAACTCATCAATTAGTACAATTAT
CACCTGTTACCAAAATCCAACGCTATCAAGACCGTTTAGGACAGTTGGACAAGCTTCTTA
GGTAGCCAAATGGCGTTAGTTTATGACGCCAAGGTTGCTGAGGCCAAGCGACTTTCGGAA
GCTTTGCTCATGTTGGATACTAGCCGAATCGTGGCGCGTGGTTATGCTATTGTCAAAAAA
GAAGAATCCGTTGTAGATTTCGGTTGAGAGTTTGAAGAAAAAAGACCAAGTAACGCTTTTG
ATGCGAGATGGTCAAGTAGAATTAGAGGTTAAAGATGTCAAAACAAAAGAAATTTGAGGA
AAATCTAGCAGAACTGGAACCATTTGTCCAAAGTTTGGAATAAGTTGCTCTGGA
AGATGCGATTACTGCCTTTCAAAGGGCATGGTCTTGTCAAAAGAGCTCCAAGCTACGCT
GGACAAGGCTGAAAAGACCTTGGTCAAGGTCATGCAAGAAGACGGAACAGAAAGTGATTT

TGAATGAAAAAGCAAGAAAAATTAGCTCTTGTGCGAGTCGGCTTTGGAAGATTTTATGGAG
 ACCAGCAGTTTGCCCTTAGTTTACGGGAGTCTGTTCTCTATTCTATTCATGCTGGTGGCA
 AGCGTATTCGGCCTTTTCTCTTGTTAGAAAGTTCTGGAAGCCTTGACAGGTTACCATCAAAC
 CTGCTCNCGCGCAGGTAGCTACTGCCTTGAGATGATTTCATACAGGGAGCTTGATTACAG
 ATGACCTTCCTGCTATGGATGATGACGAGGATCGAGAGAGGGCGGAAAAACCAATCACAA
 GAAATCCGGTGAAGCTATGGCCATCCTAGCTGGAGATGCCTCATGCTTAGACCCATATGC
 CTTGATTGCGCAGGCAGATCCGCCAAGTCAGATCAAGGTGGGCTCGATTGCCAACTCATC
 CCTTGCTTCAGGTAGCCTGGGTATGGTGGCAGGGCAAGTCTTGATATGGAGGGCGAACA
 CCAGCACTGGTCTCTGGAAGAACTTCAGACTATGCATGCCAACAAGACTGGGAAGTTACT
 AGCCTATCCCTTCCAACGCGGCAG

ORF Predictions:

ORF #	Start	End	Direction	Length
8	714	1049	F	112 aa

[SEQ ID NO:] 3175500-8 ORF translation from 714-1049,
 direction F
 VILNEKARKISSCRVGFGRFYGDQQFASSLRESVLYSIHAGGKRIRPFLLEVLALQVT
 IKPAXAQVATALEMIHTGSLIHDDLPA MDDDED RERA EKPITRNPVKLWPS*

Blastp and/or MPSearch Result:

Description:

GERANYLTRANSTRANSFERASE (EC 2.5.1.10) (FARNESYL-DIPHOSPHATE
 SYNTHASE) (FPP SYNT HASE). - BACILLUS STEAROTHERMOPHILUS.

Assembly ID: 3175674

Assembly Length: 816bp

[SEQ ID NO:] 3175674 Strep Assembly -- Assembly
 id#3175674
 CTGTTGGAAAAGTAGGTGCTTTTAAATTGCCAGTAGAAGTGGTTCAGTATGGTGCAGAGC
 AGTCTTTTCGTCATTTTGAACGAGCTGGTACCAAACAAGTTTCCGTGAAAAGACGCCAAC
 GTTTTGTGACGGATATGCAGAATTTTATCATTGACCTCGCCTTGGATGTCATTGAAAATC

CAATTGCTTTTGGACAAGAATTGGACCATGTCGTTGGTGTGTGGAGCATGGTTTATTCA
 ACCAAATGGTGGATAAGGTAATCGTTGCTGGACGAGATGGAGTTCAGATTTCAACTTCAA
 AAAAAAGGAAAATAGAAGGGGGCATAAGATGTCTAAATTTAATCGTATTTCATTTGGTGGTA
 CTGGATTCTGTAGGAATCGGTGCAGCACCAGATGCTAATAACTTTGTCAATGCAGGGGTT
 CCAGATGGAGCTTCTGACACACTGGGACACATTTCAAAAACAGTTGGTTTGAATGTCCCA
 AACATGGCTAAAATAGGTCTTGGAAATATTCTCTCGTGAAACTCCTCTTAAGACTGTAGCA
 GCTGAAAGCAATCCAACCTGGATATGCAACAAAATTAGAGGAAGTATCTCTTGGAAGGAT
 ACTATGACTGGACACTGGGAAATCATGGGACTCAACATTACTGAGCCTTTTCGATACTTTC
 TGGAACGGATTCCCAGAAGAAATCCTGACAAAATCGAAGAATCTCAGGACGCAAGGTT
 ATTCGTGAAGCCAACAAACCTTATTCAGGAACGGCTGTTATCGATGATTTTGGACCACGT
 CAGATGGAAACTGGAGAGTTGATATCTATACTTCAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	126	314	F	63 aa

[SEQ ID NO:] 3175674-6 ORF translation from 126-314,
 direction F
 VTDMQNFIIDLALDVIENPIAFGQELDHVVGVVEHGLFNQMVDKIVIVAGRDGVQISTSKK
 GK*

Blastp and/or MPSearch Result:

Description:
 unknown

Assembly ID: 3176442
 Assembly Length: 617bp

[SEQ ID NO:] 3176442 Strep Assembly -- Assembly
 id#3176442
 CTAGTACAGCTTATGCGGCCCGTTTTATTTCCGAACATCCAGATCAGCCCTTTGCAGCAA
 TTGCACCCAGAAATTTCTGCTGAAGAATATGGATTGGAACTGATTGCCGAGGATATTCAGG
 AAATGGAAGCCAATTTACACGTTTCTGGCTTCTAGGAGCTGAAAAGCCTAGTATTCCTT

TGCAAGCACAACTGAAAAGATGAGTTTGGCCTTGACATTACCTGACAACCTTCCAGGTG
 CACTTTATAAGGCCCTGTCGACCTTTGCTTGGCGAAGGGAATTGACTTGACAAAAATTGA
 AAGTCGTCCACTCAAGACAGCACTGGGTGAATACTTTTTCATTATCGATGTGGATTATAC
 CGATAAGGACTTGGTCCACTTTGCCCAAAAAGAATTAGAAGCGATTGGAATCCAGTATAA
 AATTCTGGGTGCCTATCCTATTTATCCAATATCAGACCATGGAAAGGAGAGAAGATGAGT
 AAAGAAAATCCCTTAAGTCATCATGAGCAGTTGCGTTATGATTATTTGCTAAAAAATATT
 CACTATCTCAATGAGAGAGAAAAAATGAGTTTGTCTATTTGCAAGAAAAGCTAACTCTT
 GCTAGGGGAAATAGTAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	350	478	F	43 aa

[SEQ ID NO:] 3176442-6 ORF translation from 350-478,
 direction F
 VDYTDKDLVHFAQKELEAIGIQYKILGAYPIYPISDHGKERR*

Blastp and/or MPSearch Result:

Description:
 unknown

Assembly ID: 3176630
 Assembly Length: 457bp

[SEQ ID NO:] 3176630 Strep Assembly -- Assembly
 id#3176630

CCAGTCATCAAATTGACCAAATTGAGAGTCAAATTACTTTGATTGAAAAAATATTGCGG
 CAATTGCAATGCTTTGGCAGACTTAGAGAAGCAAGAATCTAAAAATAGTGGTCGTGTT
 TTCATGCTTCGGATTTATTTGAGGAACTTCAGCATAAAGTTGCTGAAAATTCAGAACAGT
 ATGGTCAAGCCTTGGATGAAATTGAAAAACAATGAGAAAATATCCAATCTGAATTTTCAC
 AATTTGTAACCTTGAATTCATCGGGTGACCCTGTGGAAGCCGAGTGATTTTGGATAATA
 CAGAAAATCACATTTTGGCCTTAAGTCATATTGTGGATCGTGTTCCAGCCTTGGTTACGA
 CCTTTCTACAGAATTGCCAGATCAATTACAGGGATTTGGAACCGGTTATCGTAAACTAAT

TGATGCTAATTATCATTTTGTGAAACGGATATGGAA

ORF Predictions:

ORF #	Start	End	Direction	Length
6	273	419	F	49 aa

[SEQ ID NO:] 3176630-6 ORF translation from 273-419,
direction F
VEAAVILDNTENHILALSHIVDRVPALVTTFLQNCQINYRDLEPVIVN*

Blastp and/or MPSearch Result:

Description:
unknown

Assembly ID: 3176662
Assembly Length: 381bp

[SEQ ID NO:] 3176662 Strep Assembly -- Assembly
id#3176662
CTTATTTAGTACGCATTTCCCCTTGTGGGAAGTAAGTTCCTTCTGGCATGTCGTTGATGA
TGACATGGACAGCAGATTGAGGGGCTCCAGTGTTGCGGACAACTGCTTCCGTTACTTCCT
TAGCAAGAGCTTTCTTTTGCTCGAGCGTGCGTCCTTCAAATAAATCGATGCGTACAAATG
GCATAATAGCTTCCTCCACTAGTTTTGATTTCTTCCATTTTACCACATTTTGCCGTTTAA
AGCTTAAGAAAATTATGATATACTAGAATGTAGCAAAAATTTAGAAATGGACGTGAAGCA
AGAAACATGGCACAGTTGTACTATCGTTATGGGACCATGAACTCTGGTAAAACGATTGAG
ATTCTCAAAGTGGCCTATAAC

ORF Predictions:

ORF #	Start	End	Direction	Length
6	2	226	R	75 aa

[SEQ ID NO:] 3176662-6 ORF translation from 2-226,
direction R
VVKWKSKLVEEAIMPFVRIDLFEGRITLEQKKALAKEVTEAVVRNTGAPQSAVHVIINDM
PEGTYFPQGEMRTK*

Blastp and/or MPSearch Result:

Description:

4-OXALOCROTONATE TAUTOMERASE (EC 5.3.2.-). - PSEUDOMONAS
PUTIDA.

Assembly ID: 3857692

Assembly Length: 743bp

[SEQ ID NO:] 3857692 Strep Assembly -- Assembly
id#3857692
CTGGCAAATACAAGGTGACGATCATTGGTAAATCAGCCCACGGTGCTATGCCTGCTTCAG
GTGTCAATGGTGCGACTTACCTAGCCCTCTTCTTAGCCAGTTTGACTTTGCTGGTCCAG
CCAAAGAATACCTTGACATCACTGGTAAAATTCTCTTGAACGACCATGAGGGTGAAAGTC
TCAAGATTGCTCATGTGGATGAAAAGATGGGTGCCCTTTCTATGAATGCAGGCGTCTTCC
GCTTCGATGAAACAAGTGCTGATAATACCATTGCCCTCAACATCCGCTATCCAAAAGGAA
CAAGTCCAGAACAAATCAGTCAATCCTTGAAAACCTTGCCAGTTGTTTCTGTTAGCCTGTC
TGAACACGGTCACACGCCTCACTATGTGCCAATGGAAGATCCACTTGTGCAAACCTTGTT
GAATGTCTATGAAAAACAAACAGGCCTTAAAGGTCATGAACAAGTCATCGGTGGTGGAAC
CTTTGGTCGCTTGTTAGAGCGCGGAGTTGCCTATGGTGCTATGTTCCAGACTCAATTGA
TACCATGCACCAAGCCAATGAATTTATTGCCTTGGATGATCTCTTCCGAGCAGCAGCAAT
TTATGCCGAAGCTATTTACGAATTGATCAAATAAAACGATAGAAGTCTGAGATCTTATGC
TTGGACTTCTTTTTGGAGGGAAAGTAGATGTCTCAAATCGAAAGAATCAAACAGGCTATC
ATGGCGGATTACAGAATGCCAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	386	634	F	83 aa

40

[SEQ ID NO:] 3857692-6 ORF translation from 386-634,
direction F
VPMEDPLVQTLNVEKQTGLKGHEQVIGGGTFGRLLERGVAYGAMFPDSIDTMHQANEF
IALDDLFRAAAIYAEAIYELIK*

Blastp and/or MPSearch Result:

Description:

XAA-HIS DIPEPTIDASE (EC 3.4.13.3) (X-HIS DIPEPTIDASE)
(AMINOACYL- HISTIDINE DIPEPTIDASE) (CARNOSINASE). -
LACTOBACILLUS DELBRUECKII (SUBSP. LACTIS). (BLAST)

Assembly ID: 3857944

Assembly Length: 1783bp

[SEQ ID NO:] 3857944 Strep Assembly -- Assembly
id#3857944

CCACGGTGGAGGGTTGCAAAGTAAGCGACGAATTGCGTTGGTACGACCATTGAAATTGGT
GAGAGGTATGGATGTACGGTCGTAAGGACGATATCGTCGGTATCTTTGGCTACATTCTCT
TCTACGATAGTGAGGACTTTGGCACCACGGGCTGCGACCTCTTGATATTTCCACGAGTA
TGTTTGGCAAGAACTGGATCTGACAAGAGAGCCAAAACAGGCGTTCCTTCTTCAATCAAG
GCAATGGTTCCGTGCTTGAGTTCTCTGCTGCAAAACCTTCACACTGGATATAAGAAATC
TCTTTGAGTTTGAGACTTGCTTCCATGGCTACGTAGTAATCTTGACCACGTCCGATGTAA
AAGGCGTTACGAGTTGTTTCAAGAAGTCCACGAACCTTGACTTCAATGGTTTCTTTCTCT
GAAAGAGTTGATTCCAATAGACTGAGCTACGATTGACAATTCATGAACCAGGTCAAAGGC
TTGCGCTTTAGCATTACCATTTGCTTCTCCGACTGCTTTTGCAAGGAAGGCAAGGGCTGC
GATTTGCGCTGTATAGGCTTTAGTTGATGCCACGGCAATTTAGGACCTGCGTGAAGGAG
CATGGTATAGTTGGCTTCACGTGAGAGGGTTGAACCTGGAACATTTGTCACTGTTAAGCT
TGGAATTTCCATTTTATTAGCCTTGACCAAACTTGACGACTATCCGCTGTTTACCAGA
TTGGCTGATAAAGATGAAGAGTGGTTTCTTGCTGAGAAGTGGCATAACCGTAGCCCCACTC
AGATGAAATTTCAAGTTCAACTGGTGTATCTGTCAATTCTTCCAACATTTTCTTAGAAGC
AAATCCTGCATGGTAAGATGTTCCAGCTGCAAGGATGTAGATGCGGTCTGCGTCTTGAAC
AGCCTTAATGATAGCAGGATCAACCACTACTTGACCAGCATCATCCGTGTAGGCTTGAAT
GAGTTTACGCATAACAGTTGGTTGCTCATCAATTTTCCTTAAGCATGTAGTAAGGATAAGT
TCCCTTACCGATATCTGACAAGTCAAGTTCCGCAGTATAGCTAGCACGTTACGACTGTT
ACCATCATAGTCTTGGAACCTTCACGCTATCAGCCTTGACGATTACCAACTCTTGGTCAT

GGATTTCCATGTATTGGTTAGTTTCACGAATCATAGCCATGGCGTCTGAGCAGACCATGT
TATAGCCTTCTCCAAGACCAATCAAAAGTGGTGATTTATTTATAGCTACGTAGATGACTT
CAGGATCTTGTGAGTCAACCAAGGCAAAGGCATAAGAACCACGGATGATGTGAAGGGCTT
TTTTGAAGGCTTCAAGAACTGAGAGCCCTTCTTCTCCGGCAAATTTCCAATCAAATGA
ACGGCTATTTTCAGTATCTGTCTGCCCCCTTGAAGTGGTGACCTGCAAGGTATTCTTCCTTG
ATTTCAAGATAGTTCTCAATCACCCCATTTATGCACCAAGACAAAACGTTCTGTCTCAGAG
CGGTGTGGGTGAGCATTGTCCTCAGTTGGTTTTCCGTGAGTAGCCCAACGAGTATGTCCG
ATACCAGTTGTTCCCTCAACACCGGCTGTCTTGGCAGACAATTTCGATGCAATACGACCAA
CCGCCTTACCAAATGGTTATCAGCACCATTTAGGACAAAAATTCCCGCAGAATCATAGC
CACGGTATTCAAGCTTTTCAAGCCCTTGAATCAAAATATCAGTTGCATTTGTGTTTCCAA
CAACACCAACAATTCCACACATAGTATATACGACACAGGCAAG

ORF Predictions:

ORF #	Start	End	Direction	Length
7	1332	1475	R	48 aa

[SEQ ID NO:] 3857944-7 ORF translation from 1332-1475,
direction R

VHNGVIENYLEIKEEYLAGHHFKGQTDTEIAVHLIGKFAGRRRALSS*

Blastp and/or MPSearch Result:

Description:

PROBABLE GLUCOSAMINE--FRUCTOSE-6-PHOSPHATE AMINOTRANSFERASE
(ISOMERIZING) (EC 2.6.1.16) BSU21932 NCBI gi: 726479 -
Bacillus subtilis.

Assembly ID: 3858118

Assembly Length: 1729bp

[SEQ ID NO:] 3858118 Strep Assembly -- Assembly
id#3858118

CTCAGCTACTTCGCCTTTCTTTTATTCTACTGGTTTTTCTTGATTTCAGTAGTTGTAG
AAGATTCTGTTGTTTATTTTCTGAAGTTGATTCAGCAGGTTTAGAATCTCTTGATTGC

TTGGTTTGTTCGTCGCTAGCAGTTTCAATGTTAGATTCTGCAGTTGCGTTTGGTTGGT
 TCTCAGCACTGGTGTTATCACCATTTGCTTCAGCATTTCTTGCTGGACTTGTTTCTTCAC
 TTGCGCTAGCTTTTGACTGGATTTGATGATTCAAACTAGAATAGCTTTTGTGCGATTCAA
 GTAAAGCTGTTTTGTCTTTACTATTAGCAGAAAGTTGATCTAATAATGCATCCACCTTAT
 CAAAAGTCCGCATCAGATCCATTATTACTTTCTAAATAAAAGTGAAGCGACATGAGAATA
 TCGTAGAGTTTTTGATAGAGTACAAGTGTCTGAGGATCTTGCTCAGCATTTTCCTTTTCT
 TGTGAAGGGCGCTAGCGATACGAGTCAAGACATCTTTTACCTGACTGTTTACTTCATCC
 AAGTCTGCATCAGCCTTGTTTGTGGCAGCTTTTAGATTTTCTACTTCTTCTGCCAAAGAT
 TGTCTGATTTCCTTCTTCATGGATTGCTTCCAAGAGTTGATTTGCCTTGCTCAAAAGACTT
 TCTACTTCTTCCTTGCTATCTGTGCGAGATTATTGGTTGCTATCTACCATGTACTCCTAA
 AACAGGAGAGTTATAATCCAAGATTACAAGGCCTTACAGAAATAAGAAATCCAGATAAGA
 CAATGTTTCGTCCAAGACGCTATTTCGCTTCGCACAGCAGCACGGATTCAATATGCTTTAAT
 TTTAAAGTTTAGGTGTCAAGACCTCTTTTGTAGTGTGCCCAAATTTAGAGAAGTAATCAA
 TCAACTAACTTTTATTTTTTTCAAACCTTTCAGTAAACTGACCTAAAGCTAACTCAATCTG
 TCTTTGTTTCGATAGGCTTGTCTTTGTAGATGCTTCTGCTATCAGATCTAGAAGTTGATCT
 ACTTTTGCCAAGACTGCCTTCTCATCAAAAGTTCCAGGTTGATAGTTGGATTGCAGGGAT
 GGAATCTTGTTTTTCAAAGCCGCTTCATATCCCTTAGTTTGAACCTTGATGTAGTGATTG
 TGGTCGCCACGAGGAATCACAAAACCTTCTGAATCTTCACTTATAATTCGATTGGCATCA
 AAACCATGACCATCTTCTTCCTCATGGTGGACATGTAGTGACGGATTACTTAATACAGAA
 CTAGAAGAACTTCCTACCTTTTCCGTGTTAGAGTGTGATGGGGGATTGTTAAGAGATGAC
 TTAGGAATATAGTGATAGTGACCCCATGTCTTACTATATAAGCATCACCTGTATCTCTGA
 CAATATCATTAGGGTTAAAGACATAACCATCATCTGCTGCAGAAACACCATTATTCGGTG
 TCACCGACAAAGATTGACTGAGAGCTGTAGTATTCTCTGATAATTATACTTTTGCAGCTG
 CTAATTCACCTGCCGACAAGTCACTCTCAGGAATGAAATGATAGTGACCACCATGTGGTA
 CTATAGTAGATTGAAATAGAATATGAGCAAATTGATAAGGGGATTTTAAAGTAATTTCTA
 ACAATGATTTAGAACTATGATGTGCTATTCTAAATTCAACTCACTATATATAACCATCA
 TCGGTAGTATAACGTCCCTGTAATTTTGCTACAGATACTTCTGCACTAG

ORF Predictions:

ORF #	Start	End	Direction	Length
7	948	1160	R	71 aa

[SEQ ID NO:] 3858118-7 ORF translation from 948-1160,
 direction R
 VIPRGDHNHYIKVQTKGYEAALKNKIPSLQSNYQPGTFDEKAVLAKVDQLLDLIAEASTK
 TSLSNKDRLS*

Blastp and/or MPSearch Result:

Description:
unknown

Assembly ID: 3858152
Assembly Length: 1047bp

[SEQ ID NO:] 3858152 Strep Assembly -- Assembly
id#3858152

ATATTCTCAACCACTGGAGATGGCGCTCGATATCCATGATTAGATTGCGAACGAAAAGAC
GGGTCAGCTCCAGCTGGCTTTCACCAGGACCACGGGAACCAATTCCCCCTGCCTGACGGC
TGAGCATAATCCCCTGACCAACCAAGCGAGGCAAGAGGTATTTGAGTTGGGCTAGGTGGA
CTTGAGCTTCCCTTCATGGCTTCGAGCCCGCATGGCAAAGATATCCAAAATCAACTGCA
TACGGTCAATGACCTTAACACCGAGAACTTCCTCTAGATTGACATTCTGCCTTGGGGTCA
GACGGTTGTTGACGATGACAGTAGTGATTTCTTCTGCATCCACCATAAGCGCAATCTCTT
CCAACCTACCAGAGCCGACGAAGGTCTTGGGAATCATATTTTTCACGTTTTTGTCTGTAGC
TATCTACAACGACTGCCCCCTGCCGTTTTTCGCTAAACTAGCCAATTCTTCCATGGAGAGGT
CAAACTGTCCATACCCTGCAATTCCACACCAATCAGCAGGACTCGCTCCTCTTTTTTCT
CCGTTTCAATCATCTAAAACTCCTCTATCTGGCTTAAATGCGGTCTTGTACACCAGAT
TCTCCAATCTGATAAAAGGTGACCTGCATGCGATTACGGAACCAGGTCAGCTGACGCTTG
GCAAAACGACGGGTGCGCTGTTTAAGACTCTCACGAGCTTCCTCAAAGGTCTGCTCTCCA
CGGAAATAAGGAAAGAGTTCCTTATAGCCAATTCCCTTTAGCAGCCTGTACATTAGGGGAA
TGGTCAAACAGCCACTTGGCCTCATCCAAAAGCCCAGCCTCAAACATCAAATCCACTCGG
TGGTTGATACGCTCATAAAGTTGACTACGTTTCATCATCCAAGCAGATAATCAGCGGTTCA
TACAAGATCTCTTGATTTTCCAAATCCTGACCAAAATGGGCAATTCGATGGCACGCATAG
CACGACGACGATTAACTGGGGAATCTCAAGGCCTGCTTGCTCCACCAAATGGGCTAATT
CCTCATCTGAATATGGCTCCAAATTAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	546	836	R	97 aa

[SEQ ID NO:] 3858152-6 ORF translation from 546-836,
direction R

VDLMEAGLLDEAKWLFDHSPNVQAAKGIGYKELFPYFRGEQTFEEARES LKQATRRFAK

RQLTWFRNRMQVTFYQIGESGVQDRILSQIEEFLDD*

Blastp and/or MPSearch Result:

Description:

TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE TRANSFERASE (EC
2.5.1.8) (IPP TRANSFERAS E). - AGROBACTERIUM TUMEFACIENS.

Assembly ID: 3858258

Assembly Length: 1565bp

[SEQ ID NO:] 3858258 Strep Assembly -- Assembly
id#3858258

TCGAATCTGGATATGGAGATTGCCAACCATGTCGTGGTCTTTGGGGGCAAGGAAATCGAT
GTTCTTGAAAAATCTGACAGTCGCTGGAAATTAAAGCAAAGAGCTGCCAGTCTGGAAGT
TTTCTATTGTCAACCAAGAACGAGAACAGGAAATCAAGGACTATATTGACCAAATCAAAC
GTGATGGTGATACCATCGGTGGGGTTGTGGAGACAGTCGTCGGAGGCGTTCCAGTTGGTC
TTGGTTCCTATGTCCAATGGGATAGAAAATTGGATGCAAGATTGGCTCAAGCTGTTGTCT
CTATCAATGCCTTTAAAGGGGTGGAATTTGGTCTTGGCTTTGAGGCTGGTTATCGTAAAG
GCAGCCAAGTTATGGATGAAATTCTCTGGTCTAAAGAAGACGGTTATACTCGCCGTACCA
ATAATCTAGGTGGTTTTGAAGGTGGTATGACTAATGGGCAACCCATCGTTGTTTCGTGGGG
TCATGAAACCCATTCTACTCTTTATAAACCTCTTATGAGTGTGGATATCGAAACCCACG
AACCTTACAAGGCAACCGTGGAGAGAAGTGATCCGACTGCTCTTCCAGCTGCAGGAATGG
TCATGGAAGCAGTTGTAGCAACGGTTCTGGCGCAAGAAATCCTCGAAAAATTCTCATCAG
ATAATCTTGAGGAACATAAAGAAGCGGTAGCCAAACACCGAGACTATACAAAGAATATT
AAGGAGTTCCTATGGCAAAAACAATCTATATCGCAGGTCTTGGGTTGATTGGAGCCTCTA
TGGCACTTGGTATCAAACGCGATCATCCAGATTATGAAATTTTAGGTTATAATCGTAGTC
AAGCTTCGAGAGATATCGCCTTGAAAGAAGGCATGATTGACCGTGCAACGGATGATTTTG
CTAGTTTTGCTCCTTTGGCAGATGTCATTATCCTCAGCTTGCCAATCAAACAAACTATTG
CTTTCATTAAGGAGTTGGCCAATTTGGATTTGCGAGAAGGCGTTATTATTTTCAGATGCTG
GTTTCGACCAAGTCAACCATTTGTGGATGCGGCGGAGCAGTATTTGGCTGGCAAGTCTGTTC
GCTTTGTCGGGGCCCATCCCATGGCTGGTAGTCACAAGACAGGGGCTGCTTCGGCAGATG
TCAATCTTTTTGAAAATGCCTATTATATCTTTACACCTTCAAGCCTGACAAGTCAGGACA
CGCTTAAGGAAATGAAGGATCTGCTTTTCAGGTCTTCATGCTCGTTTTATCGAGATTGATG
CCAAGGAGCATGATCGTGTCACTTCTCAGATTAGCCATTTTCTCATATTTTGGCTTCTA
GTCTCATGGAGCAGACTGCGGTCTATGCTCAAGAGCATGAGATGGCAAGGCGCTTTGCGG
CAGGTGGTTTTTCGAGATATGACCCGAATTGCGGAAAGCGAGCCAGGAATGTGGACCTCCA
TTCTCTGTCCAATAGCGAGACCATTCTGGATAGAATTCAGGATTTCAAGGAACGTTTGG

AAGCGATTGGTCAGGCCATTAGTAAGGGAGATGAAGAGCAAATTTGGAACCTTTTAAACC
AAGCG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	207	722	F	172 aa

[SEQ ID NO:] 3858258-6 ORF translation from 207-722,
direction F

VETVVGVPVGLGSYVQWDRKLDARLAQAVVSINAFKGVFGLGFEAGYRKGSQVMDEIL
WSKEDGYTRRTNNLGGFEGGMTNGQPIVVRGVMKPIPTLYKPLMSVDIETHEPYKATVER
SDPTALPAAGMVMEAVVATVLAQEILEKFSSDNLEELKEAVAKHRDYTKNY*

Blastp and/or MPSearch Result:

Description:

PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TYR-SENSITIVE
(EC 4.1.2.15) (PHOSP HO-2-KETO-3-DEOXYHEPTONATE ALDOLASE)
(DAHP SYNTHETASE) (3-DEOXY-D-ARABINO-HEP TULOSONATE 7-
PHOSPHATE SYNTHASE). - BACILLUS SUBTILIS.

Assembly ID: 3858314

Assembly Length: 983bp

[SEQ ID NO:] 3858314 Strep Assembly -- Assembly
id#3858314

CTGATTAGTTTTCTTCTTTTTTGTCTTTTCAAACCTAGACCACCGAGTAAACCTGCAAGCG
CAAGCCCAAGGAAACCAATACTTGCCATTGATGTTTGAGTCTCACCAGTATTTGGTAGCA
TAGCTTTATCCTCTGACATCATCGTATCAGACATCTTGTTAGCAGAAGCAGCCATGTTTT
CACCTGCCATCGTGTTGGTAGAACTTGTCATGGTGTGTCAGCAGGCATGCTATCTGTAATAC
CTGTAGCATGATTGTGATTCATCGGAGTCACGCCAGAACCAGAGTTAGAAGGTGATAATG
AACCATTTGCTGTGTCTGAAGTTTCTTTAATTTATCTTAATAGTGACTTTTTTAGTTG
CTACGATGTTGTCCAAGTCTGGTTTACCGTCTTTGTTACCATAGACATTGACTGTAGCGC
TGTAAGTTTGAGTACCATTTGCTCGGAACTGGTCAATGAGCGCTTGTTTTCTTTGCCAG

CTACATTTCCGTCCAAGGCTACTTGATAGAAGTATTGACCTTTGGTCTTCACGTTTTTCAC
 CTAGTGGAGATAGGGCTGGGTTTTTAGCGTCGCCGTTATCTGACCATGGTGCCTTGTCAG
 ATGCCTTGAGCAAGAGACGAGTCAACATACCATCACCTGCGAAGAGTTCGTATGGAATCA
 CATGGTTGACACCTGCTGTGAATGGACCTTCACCTTGGCTTTTTCTAGGTAGGCTGCTG
 GAACATCGATACTGTCTTTAACGTTGTCTGCAACGGCTTTTTGAACTGTTCTTTAGAAA
 TTAAACCGTTTATGTTAATAGTGACTTTTTTAGTTGCTACGATGTTGTCCAAGTCTGGTT
 TACCGTCTTTGTTACCATAGACATTGACTGTAGCGCTGTAAGTTTGAGTACCATTGCTC
 GGAAGTGGTCAATGAGCGCTTGTTTTTCTTTGCCAGCTACATTTCCGTCCCAAGGCTACT
 TGATAAAATTATTGACCTTTGGC

ORF Predictions:

ORF #	Start	End	Direction	Length
6	5	661	R	219 aa

[SEQ ID NO:] 3858314-6 ORF translation from 5-661,
 direction R

VIPYELFAGDGMLTRLLKASDKAPWSDNGDAKNPALSPLGENVKTKGQYFYQVALDGNV
 AGKEKQALIDQFRANGTQYTSATVNVYGNKDGKPDLDNIVATKKVTIKINVKETSDTANG
 SLSPSNSGSGVTPMNHNHATGITDSMPADTMTSSTNTMAGENMAASANKMSDTMMSDKA
 MLPNTGETQTSMASIGFLGLALAGLLGGLGLKNKKEEN*

Blastp and/or MPSearch Result:

Description:

Probable cell wall associated protease

Assembly ID: 3858368

Assembly Length: 2138bp

[SEQ ID NO:] 3858368 Strep Assembly -- Assembly
 id#3858368

CTTCCAGAACTTCTAAACCAGCCTCCATGATTACTGGGCCAATTCGCTCTCCTAATTAGG
 AGCTACTATTTTCTTTGCCATAGCCTTCTCCTTTACACACTAGGCATATCGTGGAAGAA
 ACACTGCGTCCCATCTCACCTGCATTCTTTTTGAACAAAGGTATTAGCGTTTATATAG

GCAATAGCAGAAGCCTTCAACACATCAAAATCAAGCCCTGCTGCATTAAAGATGGTTTCT
 GTATCTCTGTTTTTCAACAGTGACCAAAACCCGATCCTGGGCATCGATTCCATCTGTTACC
 GCATTGATAGTGTAGGACACCAAACGAACAGATTGGTTAAAGAAGCTTATCGATAGCGTTA
 AAGATTGCTTCAACGGAACCTTGCCCTGTGCGATTAAATTCGACTTTCTCACCATCCATA
 TTGGCTAGGCTAACGAGCGCTTCAATGTCATTATCTGCATGAGTTTGAAGTTGTAAATCA
 TCAAAGTGGAAGCCTTCTGGATTTTCAACCATGGTTCCAGCTACCAAAGCTCGAGTATCT
 GCATCTGTGATTTCTTACTTCTTATCGGCCAGTGCCTTGAAGTTAGCAAAGAATGGTTTG
 ATATCCTCTTCTGTAAAATCTAAGGCCAATTCTCTCAGTTTCTCAACAAAAGCATGGCGA
 CCAGATAATTTTCCAAGCGGAATCTTAACACCAACCAATTCAGGTGTGATGATCTCATAA
 GTGAGAGGATTTTTAAGGACTCCATCTTGGTGAATACCAGATTTCGTGGGAGAAGGTATTG
 CCACCAACGACGGCTTTGTTTTTAGGAAGTGAATACCAGAGAAGCGAGAAACCATTCTT
 GACGTATTGATGGTCTCATTTAGGACAATACTGGTTTCTACTTGGTAGTAATCTTGGCGA
 ATATTGAGAGCCAATCGCAATCTCTTCCAAAGCAGCATTTCAGCTCGCTCCCTAATACC
 ATTGATAGTCTCTTCAACACGTCCTGCACCATTCCTTGACAGCAGCAAGGCTATTTGCCAC
 TGCCATTCGGAGGTCATCATGACAGTGAGGCGAATAGATGATCTGACGATCCGTCTTGAC
 ATCTCAATCAGGTATTTGAAGATGGCACCACATTCCTCTGGTGTGGTAAATCCTATATT
 TTCTGAAAATTTCTTCAGTAAAGAATATTTAGCTAATTGAAAGTTCATGAAAATTATTAA
 AATATTTTCAATTTTTTAGAGGTTAAGTTCCAACCTTTTTTCTATCAATTCAGTACTTCTTC
 ATCTGATAAAGTATCATCAAGGGACACACTAATCCAGTAGCGCTTGCTCATATGGAAGGC
 TGGATAAATCCCTTTTGTGAAAGCAAATTAGCTACTTGGTCATGCTTGAGGTTGACTGC
 TTCCACTTGTCTTCTCTGCCCTTTTCCAGCTTATTTCCAAGAGATTTTCATCAAGACGGC
 ATACCCTTTTGATTGCCTTCATGGCGCAATACAGCTGTATCAGGCGATTTTTCCACAG
 ATACTCCAACCTGGTTTCCATACTTTTCCTGAACTTGAGTCATGATACGCTTAGTCTGATG
 ACAGATAAAATCTTGACATCAAAACAAGCCTTCCGAATCTGGTAAAGAATCTCCAGACA
 AGCCTCACGGACATTTCCGACAAAATTTCCCTCATGCTTTCCATATGAACGTGAGGATAA
 AGGTCACCAGTCTCTTGGTCAAAGACTGGAAGTTCAACATTATCAGCAGTGATGGACAC
 AGTCATGACAAAGTCACCTTGCAAAATCTGGCAACTATATGTCCAGAATTCCTATTTTC
 CTATAAAAACCATAATCATGAAGCCTTTTTTCCTTGATTAAATTGATAGGATTTAAAAATT
 TCAAACATAAGTTGAAAAGTGTACCCCAAGGCTTAGCAGTTCCTTTCTATTTTTTAAAA
 AACAACCTTAGTACCATGCAATTGTGTTACCCCCACCTGGTCAATAAAGGTTTGACGGTT
 GTCAAGGTCAATCCCCCACCTGGTAGAATTTCAATTTTACCTTTAGCGTACTCCAAAAT
 TCTGTGATAGTGAACAAAACGTTTTTCTAAGGAGTCGCCAGACACACCAGCAGGTTAG
 GATACGAGTGACACCGGCTTGACTGAGCCAGTCAATAG

ORF Predictions:

ORF #	Start	End	Direction	Length
9	1207	1578	R	124 aa

[SEQ ID NO:] 3858368-9 ORF translation from 1207-1578,
direction R
VQDFICHQTKRIMTQVQEKYGNQLEYLWEKSPDTAVLRHEGNQKWYAVLMKISWNKLEKG
REGQVEAVNLKHDQVANLLSQKGIYPAFHMSKRYWISVSLDDTLSDEEVLELIEKSWNLT
SKK*

Blastp and/or MPSearch Result:

Description:
unknown

Assembly ID: 3858556
Assembly Length: 735bp

[SEQ ID NO:] 3858556 Strep Assembly -- Assembly
id#3858556
ACAGCTCACATCACTGTAGCTGTTGCAGAAAAATAAGGAGGTAAAATCGTGGGTCAAAAA
GTACATCCAATTGGTATGCGTGTCGGCATCATCCGTGATTGGGATGCCAAATGGTATGCT
GAAAAAGAATACGCGGATTACCTTCATGAAGATCTTGCAATCCGTAAATTCGTTCAAAAA
GAACTTGCTGACGCAGCAGTTTCAACTATTGAAGTCGAACGCGCAGTAAACAAAGTTAAC
GTTTCACTTCACACTGCTAAACCAGGTATGGTTATCGGTAAAGGTGGTGCTAACGTTGAT
GCACTCCGTGCAAACTTAACAAATTGACTGGAAAAACAAGTACACATCAACATCATCGAA
ATCAAAACAACCTGATTTGGATGCTCACCTTGTAGGTGAAGGAATTGCTCGTCAATTGGAG
CAACGTGTTGCTTTCCGTCGTGCACAAAAACAAGCAATCCAACGTGCAATGCGTGCTGGA
GCTAAAGGAATCAAACTCAAGTATCAGGTCGTTTGAACGGTGCAGATATCGCCCGTGCT
GAAGGCTACTCTGAAGGAACGTGTTCCGCTTCACACACTTCGTGCAGATATCGATTACGCT
TGGAAGAAGCAGATACTACATACGGTAACTTGGTGTTAAAGTATGGATCTACCGTGGT
GAAGTCCTCCCAGCTCGTAAAAACACTAAAGGAGGTAAATAACCAATGTTAGTACCTAAA
CGTGTTAAACACCGT

ORF Predictions:

ORF #	Start	End	Direction	Length
6	49	702	F	218 aa

[SEQ ID NO:] 3858556-6 ORF translation from 49-702,
direction F
VGQKVHPIGMRVGIIRDWDKWAYEKEYADYLHEDLAIRKFVQKELADAAVSTIEVERAV
NKVNVSLHTAKPGMVIKGGANVDALRAKLNKLTGKQVHINIEIKQPDLD AHLVGE GIA
RQLEQRVAFRR AQKQAIQRAMRAGAKGIKTQVSGRLNGADIARAEGYSEGT VPLHTLRAD
IDYAWEEADTTYGKLGVKVWIYRGEVLPARKNTKGGK*

Blastp and/or MPSearch Result:

Description:

30S RIBOSOMAL PROTEIN S3 (BS2). - BACILLUS
STEAROTHERMOPHILUS.

Assembly ID: 3858562

Assembly Length: 1965bp

[SEQ ID NO:] 3858562 Strep Assembly -- Assembly
id#3858562
CTGTGTGATTCCATTATTTGTCAAATACTTTTTAGTTTCAGCAATAACGACTTGCGACA
AGACCAAGAGGGCAATCNANTTTGGCAGAGCCATCAAGGCGTTAACGATATCTGCGATAA
TCCAGACCATNTCCAAC TCGATAAATCCTCCTAACAAGACCATGAGCACAAAAACCAACNC
GGTAGAGCCAGATAAAGCGAACCCCAAAGAGGAAC TCAAAACAGCGTTCTTCCGTAATAG
TTCCAACCTAGAATCGTTGTAAAGGCAAAAAGCACAAGGAAGATGGTCAAGAAGGCAGGC
CCAAAGTGTGAAAAGACTGTTGAGAAAGCTGACTGAGTCAAGGCAACCCCATTC AAGTCA
CCACTCCAAACTCCAGTTACCAAGATGGTCAAACCAGTTAGAGTACAAATGATGAGGGTA
TCAATAAAGGTTCTGT CATGGAAATCAAACCTTGCTCTACTGGTTCATTTGTCTTGGA
GCTGCAGCTGCAATAGGAGCAGAACCCAGACCAGATTCGTTTGAAAACACACCACGCGCC
ACACCATTTTGAATAGCCATCCGAACGCTAGCACCAGCAAATCCACCTACCGCAGCAAGG
GGACTAAAAGCTGAGGTAAAGACTAAAGCGATTGTGCCAGGGATTTTCCGATATTAAAG
AAAATAACTGTAAGAGTTCCTAAGATATAAATGATGGCCATAAAAGGAACAACAGTAGTT
GAAACCTTAGAAATAGACTTGAGTCCACCAAAGACTGCAATCGCTACAAAGACAGACAAG
ACGAGAGCTGTGATGGCTGGCGAAATCGTCGTTGTATTTTGATAGATTCTGTAATCGAG
TTGACTTGGGTGAAGGTTCCGATTCCCAAGAGAGCAACCAATACTCCTGCTACTGCAAAC
AAAACAGCAAGTGGTCGCCACTTTTCTCCCATCCCTAG AAGGATATAATGCATGGGACCT
CCCGCTACTGCACCATGGTCGTCCTTGGTGCGGTATTTGATGGCCAAGAGTCCCTCCGCA
TACTTGGTAGCCATTCCAAAGAAAGCCGCCATCCACATCCAAAATAGAGCTCCTGGTCCA
CCAACCTTGATAGCCGTCGCCAACTCCCTAATGAATATTTCCCTGTTTCCCAACCAGTTT
GAATGCCCCAAGGGCCTGTACACAAGAAGCTGTAAACTGGATACATCACCATGTCCCTT

ATCCTGGATAAAAAATAAGCTGAAAGGCCCTTGGGCAGACGCAAAACCTGCAAGAGTCCTAG
 CCGCATGGTTAGGTAAATCCCTGTTCCGACCAATAAATCAAGAGGGGCGGTCCCCAAGCA
 AAAGCATCGATTGATTTAAGCAATTCTAACATTTCTCTCTATCGTTTCAACCCCAAA
 AGAAAGAGCACATGCAAGATACATGTACTCTGGAATGCTTAGATAAATGCTAAAAAGCGG
 TCTATCCTAGCTCTGTCCCTTTTACCTGAGAGTTTGAGCAGTTGCCTGCCTTGCCCCCTCG
 GTGCCTTTACGGTCTCTCCAGAGTTCCGTCCATTTACAGTCATGGAAAAATCAAACGATTC
 CCCACTTCTATTAACTTCATTCCGGTGTGGTATTTAATTGATTCTAATTTACAAAAAA
 TGTGGCTTTTGTCAATGTGTTTATTAGTAAAAATTAGTTCAACAGTTTTTACTTTATAA
 AGTCCAGAATACTGCTATCCTTTTAAAAGTGACAATAGTCGCACCACTGCCTCCAGCATTT
 TGTGGGGCATAGCCGAACTCTTGACATGTTTGTCTCTTTGCAAGTTATCTGGTAACTCC
 TTCACGGGATGACTCCTGTTCCGATACCATGGGATGACATCAACTCGAAGCCCTTATATT
 GTTAACCAAAGCTTGGTCTGAATGAAGGTATCTAGCCCATTTCATGGCTTCTTCATAGCGCT
 TGCCTCGAAGATTCAGTCTAGCTTGAGTCCTCGCCCAGAAGTTCG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	14	178	R	55 aa

[SEQ ID NO:] 3858562-6 ORF translation from 14-178,
 direction R
 VVFVLMVLLGGFIELXMWIADIVNALMALPXXIALLVLSQVVIAETKKYFDK*

Blastp and/or MPSearch Result:

Description:

D-alanine permease (dagA) homolog - Haemophilus influenzae
 (strain Rd KW20)

Assembly ID: 3858656

Assembly Length: 1187bp

[SEQ ID NO:] 3858656 Strep Assembly -- Assembly
 id#3858656

ACGTTTGTCAATTAATTATGAACTAAGAGAAAAATTGTTTCAGGAAGCAGTAAAATTGGT

GTCAGATAATGAAACAATAATGATAGAATCTGGATCGACCTGTGCTTTACTTGCTGAGGA
 AATTTGCAAGCAAAAAAGAAATGTTACGATTGTAACAAATTCGTTTTTTATAGCAAATTT
 TGTGAGAGCTTATGATTCATGTCGTGTTATTGTTCTTGGTGGTGAGTTTCAGAAAGATTC
 ACAGGTGACTGTAGGACCTTTATTAAAAAGAAATGATACAGACTTTTCATGTGTGTCAAGC
 TTTTGTGGGACAGATGGTTACGATAAAGAGATGGGCTTTACCGGAAAAGATTTAATGCG
 CAGTGAGGTAGTTCAATATATTTTCAGCAGTGTCCGATAAAGTCATTGTCCTAACTGACTC
 AAGTAAATTTTGATAAAAGAGGTACAGTAAGAAGATTTGCTTTAAGTCAAGTCTATGAAGT
 AATAACAGACGAAAACTTTCTAAACAAAATATAGCTACATTAGAAAATGCTGGGATAAT
 GGTAAAGGTAGTTTCGTAAGAGGTTAAGTGTATGAATCAAGATAGGAATAAACTGCTTTC
 TAAAAATTGCTTATCTGTATTATATTGAAAACCTAAATCAGTCACAAATAGCAGCAAAATT
 AGGAATTTATAGAACCCTCTATTAGTAGAATGTAAACAGAAAGCAAGGAATGTAGGAATTGT
 TAAAAATTGAAATAGAGAATTTTGATACCAATATGTTTAAAGTTGGAAAATTATGTAAAGA
 AAAATACAGTTTGGAAAGTTTAGAAATTATTCCAAATGAATTTGATGATACTCCAACAAT
 TTTATCTGAAAGAATTTCTCAAGTTGCAGCAGGCGTCCTTAGGAATCTAATTGATGATAA
 TATGAAAATTGGCTTTTCTTGGGGGAAAAGTTTAAAGTAATTTAGTAGATTTAATTCACAG
 TAAAAGTGTCGAAATGTTCACTTCTATCCTCTAGCAGGTGGTCCTAGTCACATACACGC
 TAAATACCATGTGAATACACTGATTTATGAAATGTCTAGAAAAATTTTCATGGAGAGTGTAC
 ATTTATGAATGCAACGATTGTGCAAGAAAATAAATTGTTAGCAGATGGTATTTTGAATC
 AAGATATTTTGAAAATTTGAAAAATAGTTGGAAAGATTTAGATATAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	245	559	F	105 aa

[SEQ ID NO:] 3858656-6 ORF translation from 245-559,
 direction F
 VTVGPILLKEMIQTTFHVCQAFVGTGDYDKEMGFTGKDLMRSEVVQYISAVSDKVIVLTDSS
 KFDKRGTVRRFALSQVYEVITDEKLSKQNIATLENAGIMVKVVS*

Blastp and/or MPSearch Result:

Description:
 unknown

Assembly ID: 3859118

Assembly Length: 843bp

[SEQ ID NO:] 3859118 Strep Assembly -- Assembly
id#3859118

AGCTATTGCAGGAACCAAGATNATGATTTTGGTACGTGGAGTTTGGTATTTATNTACC
TCAAATCCTNGCAAATATGATTGGTTTGACTACGATTTCTTGGTTAATCAATCAAATTAT
TACTTATGGGGTTATTGCGGCGGTTGTTATCTTCTCTCCAGAGATTCGGACTGGTTTTGG
AACGTTTGGGAAGAGCGACAGATTTCTTTTCCAATGCCCCATTATTAGTGCTGAGGAACAGA
TGATTTCGTGCCTTTGTTAAGTCTGTCTGAATACATGAGTCCTCGTAAAATCGGGGCCTTGG
TTGCCTATTTCAGCGTGATACCGTACCTTGCAGGAGTATATTTTCGACAGGAATCCCCCTTGA
TGCTAAGATTTCTGCAGAACTTCTCATTAACATTTTTATTCCCAACACTCCCCCTACATGA
CGGTGCGGTGATTATCAAAGAAGAACGTATCGCTGTGACGTCTGCCTATCTGCCCTTGAC
AAAAAACACAGGTATTTCCAAGGAATTTGGGACCAGACACCGGGCGGCTATCGGTTTATC
AGAAGTCTCAGATGCCTTGACTTTTGTCTGATCAGAGGAAACGGGAGGAATTCGATAAC
CTATAATGGAAGGTTTAAGCACAACTTAACACTTGATGAATTTGAAACAGAATTACGTTG
AAATCTTACTTCCAAAAGAGGAAGTGGGTCCCTTAGTTTTAAAGAAACGAATGGCTAGGAG
GAATGGAAACATGAAAAAAAAAATAGTTTATATATCATATCCTCACTCCTTTTTTGTCTGT
GTCTTATTTGTCTATGCTACGGCGACGAATTTTCAAACAGTACCAGTGCTAGGCAGGTT
AAA

ORF Predictions:

ORF #	Start	End	Direction	Length
6	314	661	F	116 aa

[SEQ ID NO:] 3859118-6 ORF translation from 314-661,
direction F
VYRTLQEYISTGIPLDAKISAE LLINIFIPNTPLHDGAVIIKEERIAVTSAYLPLTKNTG
ISKEFGTRHRAAIGLSEVSDALTFV VSEETGGISITYNGRFKHNLT LDEFETELR*

Blastp and/or MPSearch Result:

Description:
unknown

Assembly ID: 3860084
 Assembly Length: 710bp

[SEQ ID NO:] 3860084 Strep Assembly -- Assembly
 id#3860084
 ATCGAATTAGTTGTTGGGTTGATTACCTTCCAAGAAAACTAGCCCTTCTAGCCTTACTA
 GGAGCTGGTTTTGGTTTTACTAGTCTTGTATTTGCCTTATCAGGTAAAACGTCAGATGCAG
 GACTAACATTGCTGATACGACACTAAAAAAGAAGTTGAGTTCAGTTTGTCTCAGCTTCTT
 TTTTGTACTACAGGATAATGGTTGGTCCGTAGAGACTTATACTCTTCGAAAATCTCTTC
 AAACCACGTCAGCGTCGCCTTACCGTACTCAAGTACAGCTTGCGGCTAGCTTCCTAGTTT
 GCTCTTTGATTCTCATTGAGTATTAACCTGGTCTTGACTGGGTCAAAGTGGAAGCGGTCA
 TAGGCCCCGCAAGCGGCGGAGTTGGAGCATCTGGATCAAGAGCGCTGAGTCCCATGAGA
 AGACTGGAAGTCTGGTAAAATTTTTCTAGTTCAATCAAGAATCGATTATCCACTGTTTCA
 GCCTTGGCTAGAAAACCAAGAATAGAATTTAATTCGATCCCTGAAAGCGGACGTCGTCAG
 CGCTTGCCTGTTTGCATGCTTGGTAGGCTTTGTTTAAGTCAGTAATCAAAGTATGAGCTC
 TTTTGATGGGGTCTGTATCTGTCATGGGAATGCCTCCTTTAATCTGGGTGCCAGTCTTAC
 TTCTGGCAACTGTGTTTTGATACTGTTAGTTTATCAGCTTTTAATTCGAT

ORF Predictions:

ORF #	Start	End	Direction	Length
6	294	473	R	60 aa

[SEQ ID NO:] 3860084-6 ORF translation from 294-473,
 direction R
 VDNRFLEIELEKIFYQTSSLLMGLSALDPDAPTRAARAYDRFHFDVPVKTKLILNENQRAN*

Blastp and/or MPSearch Result:

Description:
 unknown

Assembly ID: 3860172
 Assembly Length: 1975bp

[SEQ ID NO:] 3860172 Strep Assembly -- Assembly
id#3860172

CTTGATCTTGACCGATGACACGTTTGTGCAGTTCAGCTTCCAAGTTAAGTATTTCTTGG
CATCAGTCTGAGTCAGTTTTTGAACGGGGATACCTGACAAGCGACTCAAGGTGGTCAAAA
TATCAGACTCTGTCACCAAGTCTTTATAGACAGGCACTTCCTCTTCTTTTGGCGATTAGCT
GGGCTGCCTGTTTCCACTTGCCATCCATCAAGGCCTTGTCAGCTGGACTCAAGTCAGAAT
CGTCTGCTTTTACATGCTTTGATTTATTTTGCAGTGTGCTGCCGCCCTCATCCAAGAGAT
CGATAGCAGAGTCTGGCAAGTGACGACTGGTTAAATAACGATGAGCCATCTTAACCGCTG
TTTCAACCGCTTCATCTGTGATTTGTACACGGTGATGTTTCTCATAAGTCGCCCTTCAAAC
CTTGTAATAATAGTCATACTATCTGCCACACTTGGTTCTTCAATCGTCACTTTAGCGAAAC
GACGAGAAAGTGCCGCATCTTTTTTCGATATGTTTTTGATATTCTTCCTGAGTGGTGGCAC
CAACCGTTCTCAAAGTTCCACGCGCCAAGGCTGGTTTCAAGATATTGGCCGCATCCAGAG
TCGAATCAATTCCGCTACCAGAACCCATGATGGTGTGGAGTTCATCGATAAAGAGGATGA
CTTGGCCATCTTCTTCAATATCCTTGATGATATTATTTCATGCGTTCTTCAAAGTCACCAC
GGAAGCGTGTCCTGCAACGACATTCATCAAATCAAGTTCTAACACGCGCATCTTAGCCA
TTTCCGCAGGCACGTCACCACTGGCAATACGCTGGGCAAGACCAAGCGCCAGAGCTGTTT
TCCCGACACCAGCATCCCCAACCAAGACAGGGTTGTTCTTAGTCTTCCGGCTTAAGATTT
GAATCATACGTGAGATTTCCCTTGTCCTCGACCGATGACTGGTTCTAACTTGCCAGAACGCG
CTTGCTCTGTCAAATCATGCGTATAGTCCCTCAAGACCACCACTAGGAGTCTGCGGCATGC
CCATCATATTGGCCATAGAATTTTGCTTGTCAGCTACTGTACGATGGCGTTGGCGCAAAG
CCTTGAGATCTTCACGAGTCCAGCCTGCCCGTTCTTCTAAATTTGACGAAGAGCAGCAA
TCTTGACCTGATCTTCTTGCTTTCATAAGAAAAACCAGCCCTCTCCAAGATACGAGTCG
CCAAGGCATTGCCATCATGCAAAATCGCATAGAGGACGTGCTCTGTCCCTAGCACCTTAG
CATGGACCACTGACACTACATACTCTGCTTCGTCAAAAAGAACCTGCAAACGACGGGAGA
ACGGCAATTCCGTAAAGGTTTCATCCTGGCTATAGTCCGTTTCAGTCAGTTCCAAAGCCA
CCTCTTCTAAACGGTCCATCTCATACGGATAATCATTTAAAGTTGCCCTGCTACACTAT
AACTGTGATTAGACATGGCAATCAACAAGTGCCAAGACTCTAGATAACGAGGCTCCAAAA
TGTCCAGCAACCATGTAGGCACTTTCGATACATTCATTCAATGCTTTTGAATAGTTCATC
TTACTTCCCTTTTCTATCTACCTCTTGATGACCTGACGTAGCATGTTTGCTCGAACAAC
TGGAGCTTCTTCTCCTAAAACGCGATCCAAAGCTACTGATTCTAGCAAATTCATCTCCTG
CTTGGTCATCAATTCCTGCTCAACCAAAAGCTGGAGAATATCCTCATAAATTTGATGAC
TGACTCGCTCACCAATCGAGTAAAGCAGCTCCCGGAACATTTTCATGATGACTAGAAAAC
CAATCCGTCCTATACGAATGTAGCCTCCACCACCACGCTTACTTTCAACCAAGTAGCCTC
TACTTTCCGTAAAGCGTGTCTTGATCACGTAGTTAATCTGACTAGGAACAACCTGAAAGG
TATCTGCCAACTGACTCCGTTGCAACTCCACGATACCAGATTGATCTAAAATCGC

ORF Predictions:

ORF #	Start	End	Direction	Length
8	1724	1888	R	55 aa

[SEQ ID NO:] 3860172-8 ORF translation from 1724-1888,
direction R
VIKTRFTESRGYLVESKRGGGGYIRIGRIEFSSHHEMFRELLYSIGERVSHRNL*

Blastp and/or MPSearch Result:

Description:
unknown

Assembly ID: 3860242
Assembly Length: 1592bp

[SEQ ID NO:] 3860242 Strep Assembly -- Assembly
id#3860242
GCCCCATTAGTGGTAACTCTTTTTGCAGCCTTAACAGGCGCATTGATTTTTCTGGCCAC
GAATCTGGGATTTATTATTTTAAACAGTAAGAGGAAATTATGACTTTTAAATCAGGCTTT
GTAGCCATTTTAGGACGTCCCAATGTTGGGAAGTCAACCTTTTTTAAATCACGTTATGGGG
CAAAAGATTGCCATCATGAGTGACAAGGCGCAGACAACGCGCAATAAAATCATGGGAATT
TACACGACTGATAAGGAGCAAATTGTCTTTATCGACACACCAGGGATTACAAAACCTAAA
ACAGCTCTCGGAGATTTTCATGGTTGAGTCTGCCTACAGTACCCTTCGCGAAGTGGACACT
GTTCTTTTCATGGTGCCTGCTGATGAAGCGCGTGGTAAGGGGGACGATATGATTATCGAG
CGTCTCAAGGCTGCCAAGGTTCCGTGTGATTTTGGTGGTGAATAAAATCGATAAGGTCCAT
CCAGACCAGCTCTTGTCTCAGATTGATGACTTCCGTAATCAAATGGACTTTAATCGGAAA
TTGTTCCAATCTCAGCCCTTCAGGGAAATAACGTGTCTCGTCTAGTGGATATTTTGAGTG
AAAATCTGGATGAAGGTTTCCAATATTTCCCGTCTGATCAAATCACAGACCATCCAGAAC
GTTTCTTAGTTTCAGAAATGGTTCGCGAGAAAGTCTTGCACCTAACTCGTGAAGAGATTC
CGCATTCTGTAGCAGTAGTTGTTGACTCTATGAAACGAGACGAAGAGACAGACAAGGTTC
ACATCCGTGCAACCATCATGGTCGAGCGCGATAGCCAAAAGGGATTATCATCGGTAAAG
GTGGCGCTATGCTTAAGAAAATCGGTAGCATGGCCCGTCGTGATATCGAACTCATGCTAG
GAGACAAGGTCTTCCTAGAAACCTGGGTCAAGGTCAAGAAAACTGGCGGATAAAAAGC
TAGATTTGGCTGACTTGGGCTATAATGAAAGAGAATACTAAGTAGAGGTAGGCTCATGCC
TGCTTCTTGTTTTACAGAAGGAGGACTTATGCCTGAATTACCTGAGGTTGAAACCGTTT
GTCGTAGCTTAGAAAAATTGATTATAGGAAAGAAGATTTTCGAGTATAGAAATTCGCTACC
CCAAGATGATTAAGACGGATTTGGAAGAGTTTCAAAGGGAATTGCCTAGTCAGATTATCG
AGTCAATGGGACGTCGTGGAAAATATTTGCTTTTCTGCCTGACAGACAAGGTCTTGATTT
CCCATTTGCGGATGGAGGGCAAGTATTTTTATTATCCAGACCAAGTGCCTGAACGCAAGC

ATGCCCATGTTTTCTTCCGGTTTGAAGATGGGGGCACGCTTGTTTATGAGGATGTACGCA
 AGTTTGGAACCATGGAACCTCTTGGTGCCTGACCTTTTAGACGCCTACTTTATTTCTAAAA
 AATTAGGTCCTGAACCAAGCGAACAAGACTTTGATTACAGGTCTTTCAAGCTGCCCTTG
 CCAAGTCCAAAAAGCCTATCAAATCCCATCTCCTAGACCAGACCTTGGTAGCTGGACTTG
 GCAATATCTATGTGGATGAGTTCTCTGGCGAG

ORF Predictions:

ORF #	Start	End	Direction	Length
7	573	1001	F	143 aa

[SEQ ID NO:] 3860242-7 ORF translation from 573-1001,
 direction F
 VSRLVDILSENLDGEFQYFPSDQITDHPERFLVSEMVREKVLHLTREEIPHSVAVVVDSM
 KRDEETDKVHIRATIMVERDSQKGIIIGKGGAMLKKIGSMARRDIELMLGDKVFLETWVK
 VKKNWRDKKLDLADLGYNERY*

Blastp and/or MPSearch Result:

Description:

GTP-BINDING PROTEIN ERA HOMOLOG. - STREPTOCOCCUS MUTANS.

Assembly ID: 3860282

Assembly Length: 1604bp

[SEQ ID NO:] 3860282 Strep Assembly -- Assembly
 id#3860282

TCATCAAAAGCAGTTAACGAATTGTGAGCGTGTTATGAGAAATCATGAAAGTACGGAC
 CGATACATATAAAAAGGATTTAACTATGGAAGAATTCTCTGTATTGGTTGTGGAGCAACC
 ATTCAGACGACAGATAAAGCTGGTCTTGGTTTTACCCCCAGTCGGCACTTGAAAAAGGT
 TTGGAGACTGGCGAAGTCTATTGCCAACGCTGTTTCCGTCTCCGCCACTACAATGAATCA
 CAGATGTCCAGTTGACGAACGATGATTTCTCAAGCTCTTGACGAGGTGGGAGACAGTG
 ATGCTTTAGTGGTCAATGTCATTGATATCTTTGATTTTAATGGATCTGTCATCCCAGGTT
 TACCACGTTTCGTCTCGGGCAATGATGTCCTCTTGGTAGGAAATAAAAAAGATATCCTTC
 CTAAGTCAGTTAAGTCTGGTAAGATTAGCCAGTGGCTCATGAAACGTGCCCATGAAGAAG

GTCTTCGTCCAGTCGATGTGGTCCTAACTTCAGCACAAAATAAACATGCCATTAAGGAAG
 TCATTGACAAGATTGAACACTACCGTAAGGGCCGCGATGTCTATGTGGTCGGTGTGACCA
 ACGTTGGAAAATCAACTCTAATCAATGCTATTATCCAAGAAATCACGGGTGATCAGAATG
 TCATCACTACTTCACGCTTCCCAGGGACAACCTTGGACAAAATAGAGATTCCGCTTGACG
 ACGGATCTTATATTTACGATACGCCGGAATTATCCACCGTCACCAGATGGCTCACTACT
 TGACGGCCAAAACCTCAAGTATGTCAGTCCTAAAAAGGAAATCAAGCCTAAGACCTATC
 AGCTTAATCCTGAGCAAAACCTATTTTTAGGTGGTTTGGGACGCTTTGACTTTATAGCAG
 GAGAAAAGCAAGGATTTACTGCTTTCTTTGATAATGAACTCAAACCTCCATCGTAGCAAGC
 TTGAAGGAGCTAGTGCTTTCTACGATAAGCACCTGGGAACTCTTCTGACACCACCAAATA
 GCAAGGAAAAAGAAGATTTCCCAAGGCTAGTCCAGCATGTCTTTACCATTAAAGATAAGA
 CAGACCTAGTCATCTCAGGCCTAGGATGGATTTCGTGTAACAGGCACAGCAAAAGTCGCCG
 TCTGGGCACCAGAAGGCGTCGCCGTCGTCACACGAAAAGCAATTATTTAAGCACAGAAAAG
 GAAAGGGTTGTCTGAATTTGGGCGAGCAAGGCGAGCCCCATAGAGAATACTTTTCGCTGT
 GGTGTAAGTTGGTACAAGTGATTGTACCAACTGCGGAAAATTTGAGACCTTAGGCTCAAA
 TTTTAGTCATGAAAGTCCGAAGGACTTTGCTGACGTCCGTCACCACTTCAGAAAAGTATA
 AAAAGAACTCTTTTAAAGAAATTATGTCATTAACATCAAACAACGTGCCTTCCTCAAC
 AGCCAGGCACACACCCTCAAACCTATCATCAAATCGGGAAAAATGGACTCAACGACCAA
 ATCAAACCAGCGTCCGTCAAGCTCTTGATGCCCGTTGAATTAATCAAGGTTACTCCCC
 TTTACAAAACACAGATTGAAAACATCCCGGACGAATGTAATTCTG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	288	1190	F	301 aa

[SEQ ID NO:] 3860282-6 ORF translation from 288-1190,
direction F

VGDS DALVNVNIDIFDFNGSVIPGLPRFVSGNDVLLVGNKKDILPKSVKSGKISQWLMKR
 AHEEGLRPVDVVL TSAQNKHAIKEVIDKIEHYRKGRDVYVVGVTNVGKSTLINAI IQEIT
 GDQNVITTSRFP GTTL DKIEIPLDDGSYIYDTPGIIHRHQMAHYLTAKNLKYVSPKKEIK
 PKTYQLNPEQTLFLGGLGRFDFIAGEKQGFTAFFDNELKLHRSKLEGASAFYDKHLGTLT
 TPPNSKEKEDFPRLVQHVFTIKDKTDLVISGLGWIRVTGTAKVAVWAPEGVAVVTRKAI I
 *

Blastp and/or MPSearch Result:

Description:

unknown

Assembly ID: 3860296
Assembly Length: 2025bp

[SEQ ID NO:] 3860296 Strep Assembly -- Assembly
id#3860296

CCGTAATGGGTCGTAACCTTGCCCTTAATATTGAATCACGTGGTTACACAATTGCTATCT
ACAACCGTAGTAAAGAAAAACGGAAGATGTGATTGCTTGCCATCCTGAAAAGAACTTTG
TACCAAGCTATGACGTTGAAAGTTTTGTAACTCAATCGAAAAACCTCGTCGTATCATGC
TGATGGTTCAAGCTGGACCTGGTACAGATGCTACTATCCAAGCCCTTCTTCCACACCTTG
ACAAGGGTGATATCTTGATTGACGGTGGAAATACTTTCTACAAAGATACCATCCGTCGTA
ATGAAGAATTGGCAAACTCAGGTATCAACTTTATCGGTACTGGAGTTTCTGGTGGTGAAA
AAGGTGCCCTTGAAGGTCCTTCTATCATGCCTGGTGGACAAAAAGAGGCCTACGAATTGG
TTGCGGATGTTCTTGAAGAAATCTCAGCTAAAGCACCAGAAGATGGCAAGCCATGTGTGA
CTTACATCGGTCCTGATGGAGCTGGTCACATGTGAAAATGGTTCACAATGGTATTGAGT
ACGGTGATATGCAATTGATCGCAGAAAGCTATGACTTGATGCAACACTTGCTAGGCCTTT
CTGCAGAGGATATGGCTGAAATCTTTACTGAGTGGAACAAGGGTGAATTAGACAGCTACT
TGATCGAAATCACAGCTGATATCTTGAGCCGTAAAGACGATGAAGGCCAAGATGGACCAA
TCGTAGACTACATCCTTGATGCTGCAGGTAACAAGGGAAGTGGTAAATGGACGAGCCAAT
CATCTCTTGACCTTGGTGTACCATTGTCACGTGATTACTGAGTCAGTGTGTCACGCTACA
TTTCAACTTACAAAGAAGAACGTGTACATGCTAGCAAGGTGCTTCCAAAACCAGCTGCCT
TCAACTTTGAAGGAGACAAGGCTGAATTGATTGAAAAAATCCGTCAAGCCCTTTACTTCT
CAAAAATCATTTTCATACGCACAAGGATTTGCTCAATTGCGTGTAGCCTCTAAAGAAAAACA
ACTGGAACCTTGCCATTTGCAGATATCGCATCTATCTGGCGTGATGGCTGTATCATCCGTT
CTCGTTTTCTTGCAAAAGATTACAGATGCTTACAACCGCGATGCAGATCTTGCCAACCTTC
TTTTGGACGAGTACTTCTTGATGTTACTGCTAAGTACCAACAAGCAGTACGTGATATCG
TAGCTCTTGCGGTTCAAGCAGGTGTGCCAGTGCCAACTTTCTCAGCAGCTATTACTTACT
TTGATAGCTACCGTTCAGCTGACCTTCCAGCTAACTTGATCCAAGCACAACGTGACTACT
TTGGTGCTCACACTTACCAACGTAAAGACAAAGAAGGAACCTTCCACTACTCTTGGTATG
ACGAAAAATAAGTAGGTCAGCCATGGGGAAACGGATTTTATTACTTGAGAAAGAACGAAA
TCTAGCTCATTTTTTAAGTTTGGAACCTCCAGAAAGAGCAGTATCGGGTTGATCTGGTAGA
GGAGGGGCAAAAAGCCCTCTCCATGGCTCTTCAGACAGACTATGATTTGATTTTATTGAA
TGTTAATCTGGGAGATATGATGGCTCAGGATTTTGCAGAAAAATTGAGCCGAACATAACC
TGCCTCAGTCATCATGATTTTAGATCATTTGGAAGACTTGCAAGAAGAGCTGGAAGTTGT
TCAGCGTTTTGCAGTTTTCATACATCTATAAGCCAGTCCTTATCGAAAATCTGGTAGCGCG
TATTTTCGGCGATCTTCCGAGGTCGGGACTTCATTGATCAACACTGCAGTCTGATGAAAGT
TCCAAGGACCTACCGCAATCTTAGGATAGATGTTGAACATCACACGGTTTATCGTGGTGA
AGAGATGATTGCTCTGACACGCCGTGAGTATGACCTTTTGGCGACACTTATGGGAAGCAA
NGAAGTATTGACTCGTGAGCAATTGTTGGAAAGTGTTTGGAAAGTATGAAAGTGCGACCGA
GACAAATATCGTAGATGTCTATATCCGCTATCTACGGAGCAAGCT

ORF Predictions:

ORF #	Start	End	Direction	Length
8	1697	1843	R	49 aa

[SEQ ID NO:] 3860296-8 ORF translation from 1697-1843,
direction R

VMFNIYPKIAVGPWNFHTAVLINEVPTSEDRRNTRYQIFDKDWLIDV*

Blastp and/or MPSearch Result:

Description:

unknown

Assembly ID: 3860406

Assembly Length: 1578bp

[SEQ ID NO:] 3860406 Strep Assembly -- Assembly
id#3860406

CTACACCGGTTTGGTTAAAAATCGTATGCAAACCAAGGAGGCTTGGAGTCAGATTGATGT
TCAGTTGAAACGTCGAAATGACCTCTTGCCAACTTGATTGAGACTGTAAAAGGTTATGC
CAAATATGAAGGTTCTACCTTGAAAAGGTGGCAGAACTACGTAACCAAGTGGCGGCAGCG
AATTCACCAGCAGAAGCTATGAAAGCCAGTGATGCCCTCAATCGTCAGGTTTCAGGTATT
TTTGCAGTTGCAGAAAGCTATCCAGATTTGAAAGCTAGTGCTAACTTTGTTAAATTGCAA
GAGGAGTTGACAAATACAGAAAATAAAATTTCTTACTCTCGTCAACTCTATAACAGTGTT
GTCAGCAACTACAATGTAAAATTAGAACTTTCCCGAGCAATATTATCGCTGGAATGTTT
GGATTTAAAGCGGCAGATTTCCCTTCAAACACCTGAAGAGGAAAAGTCGGTTCCCTAAAGTT
GATTTTAGCGGTTTAGGTGACTAAGATGTTGTTTGATCAAATTGCAAGCAATAAACGAAA
AACCTGGATTTTGTTGCTGGTATTTTTCTTACTCTTAGCTCTTGTTGGTTATGCGGTTGG
TTATCTCTTTATAAGATCTGGACTTGGTGGTTTGGTTATCGCACTGATTATCGGCTTTAT
CTACGCTTTGTCTATGATTTTTCAATCGACAGAGATTGTCATGTCCATGAATGGAGCGCG
TGAGGTGGATGAGCAAACGGCACCAGACCTCTACCATGTAGTGGAAGATATGGCTCTGGT
CGCTCAGATTCCCTATGCCCCGTATTTTCATCATTGATGATCCAGCCTTAAATGCCCTTTCG
GACAGGTTCTAATCCTCAAAATGCGGCTGTTGCTGCGACTTCAGGTCTACTAGCTATCAT

GAATCGTGAAGAACTAGAAAGCTGTTATGGGACATGAAGTCAGTCATATTCGTAATTATGA
TATCCGTATTTTCGACTATTGCAGTTGCCCTTGCTAGTGCTATCACCATGCTTTCTAGTAT
GGCAGGTCGTATGATGTGGTGGGGTGGAGCAGGTCGCAGACGAAGTGATGATGACCGAGA
TGGAAATGGTCTTGAAATCATTATGCTAGTGGTTCCCTACTAGCTATTGTACTGGCACC
TCTCGCTGCAACCTTGGTTCAGCTCGCTATTTCTCGTCAGAGGGAATTTCTGGCAGATGC
ATCTAGTGTGAGCTGACTCGCAATCCCCAGGGAATGATTAATGCCCTAGATAAGTTGGA
CAATAGCAAACCTATGAGTCGCCACGTCGATGATGCTAGCAGTGCCCTTTATATCAATGC
TCCCAAGAAAGGTGGGGGGGTCCAAAACTCTTTTATACCCACCCACCTATCTCAGAACG
GATTGAACGTTTAAACAGATGTAAATGAAGGCTGGAAAAAAGTCTTTAAATCTGAAA
AATGCATAATATCAGGTGTGAAAACCTGATATTATGCGTTTACTATGGGAAGATTTACT
TCTTTTTCTCCTAAATTTGTGTTTTTGGCCACCTATCTGCTATGTTGCAAATTCGATAA
ATCTTCTAAATTAAC TAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	148	504	F	119 aa
7	497	1405	F	303 aa

[SEQ ID NO:] 3860406-6 ORF translation from 148-504,
direction F
VAELRNQVAAANSPAEAMKASDALNRQVSGIFAVAESYPDLKASANFVKLQEELTNTENK
ISYSRQLYNSVVSNNVVKLETFPSNIIAGMFGFKAADFLQTPEEEKSVPKVDFSGGLGD*

Blastp and/or MPSearch Result:

Description:
unknown

[SEQ ID NO:] 3860406-7 ORF translation from 497-1405,
direction F
VTKMLFDQIASNKRKTWILLVFFLLALVGYAVGYLFIRSLGGLVIALIIGFIYALSM
IFQSTEIVMSMNGAREVDEQTAPDLYHVVEDMALVAQIPMPRIIFIIDDPALNAFATGSNP
QNAAVAATSGLLAIMNREELEAVMGHEVSHIRNYDIRISTIAVALASAITMLSSMAGRMM
WWGGAGRRRSDDDRDGNLEIIMLVVSLAIVLAPLAATLVQLAISRQREFLADASSVEL
TRNPQGMINALDKLNSKPMSRHVDDASSALYINAPKGGGVQKLFYTHPPISERIERLK
QM*

Blastp and/or MPSearch Result:

Description:

HEAT SHOCK PROTEIN HTPX PRECURSOR. - ESCHERICHIA COLI.

Assembly ID: 3860416

Assembly Length: 1644bp

[SEQ ID NO:] 3860416 Strep Assembly -- Assembly
id#3860416

TTTTTACCACTTCACCGGAGTTTTTCTTCCTTAACTTCCATCAGGATTAATCGCTGTAAA
GATACGTTTCTTTAACCAGTTTTTCTTCTTGTTCNACACGAGTTTCACCTAGAAACAGT
GTTGAATCTTTTTTCTCAACTGTCTTGAAGGCCAAATCTTTTTCAACAAAATTTTCGAGTT
GTGGGGAAGATCTTTCTTGTAACAGCAGCAACTGTCTTCTCCAGAACTGGTTTTTCCC
TTAGTCAACTGGATACCGGTATTCCTTAACTTGTTTTCCACTTTCTGAAACGAGGCGAAC
AAGTACTGGAAGGCAATCTTCTCCACTATCTACCACAGTTGAAGCTACTTGATTGTTTTT
TTCAACTGAGACTTTTGGCCGTTGACCTTTATAGGTAATTTGATAGTCTTGACGATTTTC
AGCGAAATCAGCAAGTTCTTTTCCATCTACAAGAACTTCGATTGCGTGCTTTCTTGAGG
CAATTCACCTTGGTGCAAGGAAGGTCATCTCAATCATCGCAACACCGCTCTTATCTGCTTT
ACGCTCCATACGCCATCTCATAGCTTTGGCTTTGACAGCTTTAAATGTTACGTTGATTTC
ATCACCAGCTGCGATGTCTTTATCCGCACGATAAGGCACAGCTTCCCAATTTTCTGGATT
GTTGAATGGATGGTCTGCGTCGTAGGCTTGGTAGTTTGAATAGTAGGTTGGCACTTCAAA
CTCTGGACCGACATAGCGTTCTAAAACGAGTTTAGTTGGTGCATCCGTACCACTATCTGC
AAAGAAGTGAAGTTTGGCTTGCGCAACAGTCCGTTCTACAATCTTACCATTTTACGGAA
GATCACACCCGCTGATACTTCTGGATTAGAAGATGGTGTGGAGACCAGTTTGTCCAACG
ACGATTTTCTGAATGATCTCCGTCATTGAGATAGTCAACGCGGTCATGAGAGTTTTTGTC
AATATCATTTGGTTGCTGAAGCAAAGGCCTGGTTACTGTTTTCATCATAGTTAGGGTTATC
TGAAAGAGCTTCGCCTAGTTTGTCTGTCACTCGTACAGTGACCTCAGCAACAAGATCACT
ACCAAGGACATGGCCTCGAACGGTAAATTGACCTGCTTTTGTTCAGATTTTCTGCTGGAAC
TTCTTCCCATTTCAACTGACAAATCTTTTGTTCGTAGCCGTCTTTACCTGTGAAGTAAAC
TGGAACCTTAGTCGGCAATTCAAGTGCTTGACCTACTTGTAGCAAGCGAGCTTGTTTAAC
CGCAGCAACTGGTTTATGAGAAAGTAAGTTCTTATCCTTAGTGAAGTGCAGACGGTATTC
TCCTAAGATGTCGCCATTTTCAGCTTTCGCGATGACACGAACTGGCTCACCTTCACGAAC
GCTTGGAACGACGGTAGCGAGACCATTGTTGCTAACACTTGGCTGTGACTGCCGGAACCT
TCCCATCTACAGACTCAAGGTAGTATCTGTCAGATCAGGTTGAAGTTTGCTAAGTCTTTA
CCGTCAACTTGGATTCTTGTTGTCCTTGCTTGGCTGCCGCAACTTGTTTCGCAAAGATTT
GTACCTCTGTGATAACGTTCCCTAATTTGTTGTCTGCTCTCACCATGGCGAATACGAACAG
CATAGGTTTCACTTTATCAAGAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	72	281	R	70 aa

[SEQ ID NO:] 3860416-6 ORF translation from 72-281,
 direction R
 VENKL RNTGIQLTKGKTSFWRKTVA AVTRKIFPTTRNFVEKDLAFKTVEKKDSTLFLGET
 RXEQEGKTG*

Blastp and/or MPSearch Result:

Description:
 unknown

Assembly ID: 3860712
 Assembly Length: 1087bp

[SEQ ID NO:] 3860712 Strep Assembly -- Assembly
 id#3860712
 ATCGAATTGCAAGTATGGCCATTGTCTTTCTATGTTAGTTTCTTTTAAAGACTGTAAATC
 AAGGAATCCCTTACTATTTCATAGCGTAACGATTCTACAGGATCCATTTTACTAATCTTAC
 GCGCCGGGAAGTAGGCTGAGACATAACCAAGTAATAGAGCGAAACTAGAGTTCCTAAAA
 CAGATAAAAGATTTAATTCAAAAACCTTAGTGATGGATGGGTAAAAGTGACTTACAATCG
 CATTGCGCCAACTTCCCACCCCTTGTGCAACCAAAAATGCCAGCAGCAAGGCGATGCCTA
 CAATCCAGATAGCCTCGTAAATAAAAAATTCCTTTGACATCACGATTCTGATAACCAACTG
 CTTTCATGACACCTATTTCCCTTGGAACGTTGCATGATATTGATGTAAATAATGATACCAA
 TCATAACCGCTGCTACCACAATAGCTTGTGATGAAAGCACAATCAATAATCCCTGAATAA
 CACGAATAAAGGTAATCACAATATCAAGAACTCTCTGTTAAGAAAGCACAGTATACTTCT
 TATTTTTCTGTAATTCTTCTGTACTACTTTTGTCTGTGATGGATCTTTGAGTTCCAAGA
 TAAATAAGATACAGCTTTCGTAAATCCAGCCTCTTTCAAATCGTTTCCATTTGATGAG
 ACAGCATGAAACTGTTGCTGTCCCTCCATGTCATCTTCATCATTGATTACACGTACAATCT
 TCGTTTGAAATTGAGCAATCTTACTAGTTTCGGCAGCACTTTCTACAATGCTGACTGAGA
 CTGATTTGCCAATAAGATCATTAGCTGTCAAATTTTTTCCTGTCTGTTCAATTTT

TTAGTAAACTGCTTGGAATCGTTAATCCCTGTTTCATTTGTATCAGTATAGAGGGATCCAG
CCAACACTTTGTCCGTCTCATTATTACTAACAGAGATACTTGTATCATCATAAAGACTCA
CTACTTGAGCATAAGAAGCATCGTTTGACTCAAAATCCATTTCTTGCCCATCTTTTCTTGC
CCATCTATAGTAATATTTGACATGTTTCATCCCAAAGGACTCTCCAAATATTTAATAGAT
CGAGCCT

ORF Predictions:

ORF #	Start	End	Direction	Length
6	74	499	R	142 aa

[SEQ ID NO:] 3860712-6 ORF translation from 74-499,
direction R
VITFIRVIQGLLIVLSSQAIVVAAMIGIIIIYINIMQRSKEIGVMKAVGYQNRDVKGIFI
YEAIWIVGIALLLAFLVAQGVGSLANAIVSHFYPSITKVFELNLLSVLGLTVFALLGYV
SAYFPARKISKMDPVESLRYE*

Blastp and/or MPSearch Result:

Description:
unknown

Assembly ID: 3860728
Assembly Length: 1283bp

[SEQ ID NO:] 3860728 Strep Assembly -- Assembly
id#3860728
ATCGAATTGAAAAATACAGCATGCCTTTTGTCCAATTGGTACTTGAAAAAGGAGAAGAAG
ACCGTATCTTTTCAGACTTGACTCAAATCAAGCAAGTTGTTGAAAAACAGGTCTGCCTT
CTTTTTTAAACAAGTGGCAGTAGACGAGTCGGATAAGGAAAAACGAATTGCTTTTTTC
CAAGATTCTGTGTCGCCTTTATTACAAAACCTTTATCCAGGTTCTGGCCTACAATCACAGA
GCAAACTTTTTTATGATGTGCTTGTAGATTGCTTGAACCGACTTGAAAAAGAAACAAAT
CGATTTGAAGTGACGATTACGTCTGCTCATCCTCTAACTGATGAACAGAAAGACTCGTTTG
CTCCCTTTGATTGAGAAAAAATGTCTCTGAAAGTAAGGAGTGTAAGAACAACAAATCGAT
GAAAGTCTCATTTGGTGGTTTTGTCATTTTTGCCAATCACAAGACAATTGATGTGAGTATT

AAACAACAACCTTAAAGTTGTTAAAGAAAATTTGAAATAGAAAGTGGTGTTCCTTTTGGCAA
 TTAACGCACAAGAAATCAGCGCTTTAATTAAGCAACAAATTGAAAATTTCAAACCCAATT
 TTGATGTGACTGAAACAGGTGTTGTAACCTATATCGGGGACGGTATCGCGCGTGCTCATG
 GCCTTGAAAATGTCATGAGTGGAGAGTTATCGAATTTTGAAAACGGCTCTTATGGTATGG
 CTCAAAACCTTGGAGTCAACAGACGTTGGTATTATCATCCTAGGTGACTTTACAGATATCC
 GTGAAGGCGATACAATCCGCCGTACAGGGAAAATCATGGAAGTCCCTGTAGGTGAAAGTC
 TGATTGGTCGTGTTGTGGATCCGCTTGGTCCGAGTTGACGGTCTTGGAGAAATCCACA
 CTGATAAAACTCGTCCAGTAGAAGCACCAGCTCCTGGTGTATGCAACGTAAGTCTGTTT
 CAGAACCATTGCAAACCTGGTTTGAAGCTATTGACGCCCTTGTACCGATTGGTTCGTGGTC
 AACGTGAGTTGATTATCGGTGACCGTCAGACAGGGAAAACAACCATTGCGATTGATACAA
 TCTTGAACCAAAAAGATCAAGATATGATCTGTATCTACGTCGCGATTGGACAAAAAGAAT
 CAACAGTTCGTACGCAAGTAGAAACACTTCGTCAGTACGGTGCCTTGGACTACACAATCG
 TTGTGACAGCCTCTGCTTCACAACCATCTCCATTGCTCTTCCTAGCTCCTTATGCTGGGG
 TTGCTATGGCGGAAGAATTCGAT

ORF Predictions:

ORF #	Start	End	Direction	Length
6	259	519	F	87 aa

[SEQ ID NO:] 3860728-6 ORF translation from 259-519,
 direction F
 VLVDCLNRLEKETNRFEVTITSAHPLTDEQKTRLLPLIEKKMSLKVRSVKEQIDESLIGG
 FVIFANHKTIIDVSIKQQLKVVKENLK*

Blastp and/or MPSearch Result:

Description:

ATP SYNTHASE DELTA CHAIN (EC 3.6.1.34). - ENTEROCOCCUS
 FAECALIS (STREPTOCOCCUS FAECALIS).

Assembly ID: 3860794

Assembly Length: 1402bp

[SEQ ID NO:] 3860794 Strep Assembly -- Assembly
id#3860794

CTAATCAATCCAAAAGGAGCAACCAAATAACTGGTCCACCATTCCCAATGAGCATCTGCA
AAAAGTTTTCAACCCATAGCTGGCAATGCAATATTAAGAATGTCTTTATTTTCTTAAAC
AATCTCTCCTTCCTGATGAAAAGAACTCAGTTGGTTTCCCAACCGAGTTACTCCCTCT
ATCTTAAAGTCCTAAATAAGCCTCAACCGCTACTTGCATGTCAGCAGCTGCCACTGTTGT
CTTGTGACGAACAGGAGCTGTCTCAAGCCCATCAACTGCTGGTGGCACTGCAACGCCTGA
GATTTTCATGTAATTGAGCCAAAGCTTCAAAGTCTGTTAAACCTGCTTTTCCAGTTACAGC
TTCTACTGCAACTACTGGGAAGTGTAGGGACTAGCTGTTGAAGCAATCACTGTCTTAGT
CGCATCATCAGTAACCGCTTGGTATTTTCTATAAACTGCTGAGGCAACCGCCGTATGTGG
ATCCTCAATATAAGAATCTAACTCATAAACACGCTTGATTTCTGCCGCTGTTTCTTCCCTC
AGTCGCATATTCAGCTGCAAAGAGCTCCAGAATCTCTACATCAAAATCAGTCAGTTCATA
TTGTCCTTGTGTATTCAAGGTATTCATGAGTTCAGCCGTCTTAACCGCATCATTCCCCAA
AAGATGGAAAATCAAACGCTCCAAGTTTGAAGATACCAAGATATCCATAGATGGGCTGGT
TGTTACCTTAACTCACGTTTCTTGTGCTAAACACGTGTCTTGAAGAAGTCTGTCAAAAC
ATTGTTATCATTTGAAGCACAGATCAATTTACCAACTGGGAGACCGATTTGTTTGGCATA
AAAGGCAGCCAAGATATTTCCAAAAGTTTCCTGTTGGTACTGTGAAGTTAATCTTATCAC
CAGCCACGATCTCACCAGTCTTGACCAACTGAGCCATAGGCCATAAACATTAATTAACA
ATCTGTGGCACCCAAACGACCGCATATTCATAGAGTTTTAGCAGATGAAAATTGCAACCT
TGTTGGCCGCTAATCTTTCACGAAGAGCCACGTCGTTAAACATGTGCTTCACGTTGGTTT
GCGCATCGTCAAAGTTACCATCTATAGCGATAACATGAGTATTGTCACCATTATGAGTGG
TCATTTGCAACTCTTGACCTTGCTGACACCACCTTTGGATAAAAGACGATAATCTCAG
TACCAGGCACATCCGCAAAACCCCGCCATAGCAGCTTTCCCCGTGTCACCAGATGTCGCTG
TCAAGATAACAATCTTGTTCTCAAACCATGTTTTTTTAGCAGCAGTCGTCATAAAGTATG
GCAAAATAGACNAGGCCATATCCTTAAAGGCAATNGTTGAACCATGGAAAAGTTCCAAAT
TGTATTGCCCATCTAATTTCGAT

ORF Predictions:

ORF #	Start	End	Direction	Length
6	184	915	R	244 aa

[SEQ ID NO:] 3860794-6 ORF translation from 184-915,
direction R

VRSWLIVRLTSQYQQETFGNILAAFYAKQIGLPVGKLICASNDNNVLTDFFKTRVYDKKR
EFKVTTSPSMDILVSSNLERLIFHLLGNDVKTAEMLNLTNTQGQYELTDFDVEILELFA
AEYATEEETA AEIKRVYELDSYIEDPHTAVASAVYRKYQAVTDDATKTVIASASPYPKFP
VVAVEAVTGKAGLTDFEALQLHEISGVAVPPAVDGLETA PVRHKT TVAAADMQVAVEAY
LGL*

Blastp and/or MPSearch Result:

Description:

Probable threonine synthase

Assembly ID: 3860830

Assembly Length: 989bp

[SEQ ID NO:] 3860830 Strep Assembly -- Assembly
id#3860830

CTCTTCGTCACATGGAAGAAGTTGGATTCAAATCCTTCAATCTTGGTCCAGAGCCAGAAT
TCTTCCTATTTAAGTTGGATGAAAATGGGGACCCAACACTTGAAGTGAATGACAAGGGTG
GCTAATTTGGATTGGCACCTTACTGACCTTGGCGACAACACACGTCGTGAGATTGTGAA
TGTCTTGACCAAAATGGGATTTGAAGTAGAAGCGAGTCACCACGAGGTTGCGGTTGGACA
GCATGAGATTGACTTTAAGTACGATGAAGTTCTCCCGTGCTTGTGATAAGATTCAAATCT
TTAAACTTGTGTAAACCATTGCTCGCAAACACGGACTTTACGCAACATTTATGGCGA
AGCCAAAATTTGGTATTGCTGGATCAGGTATGCACTGTAATATGTCCTTGTTTGATGCAG
AAGGAAATAACGCCTTCTTTGATCCAAATGATCCAAAAGGAATGCAGTTGTCAGAAACAG
CTTACCATTTCTAGGCGGTTTGATCAAGCATGCTTACAACATACTGCCATCATGAACC
CAACAGTTAACTCATACAAACGTTTGGTTCCAGGTTATGAAGCGCCTGTTTACATTGCTT
GGGCTGGTTCGTAACCGTTCGCCACTTGTGCGATCAGCGTACCTGCTTCACGTGGTATGGG
AACTCGTCTTGAGTTGCGTTCAGTGGATCCAATGGCGAACCCTTACGTTGCTATGGCTGT
TCTTTTGAAGTTGGTTTGTATGGTATTGAAAATAAAATCGAAGCACCAGCTCCTATCGA
AGAAAATATCTACATCATGACAGCAGAAGAGCGCAAGGAAGCTGGTATTACAGACCTTCC
ATCAACTCTTCACAACGCTTTGAAAGCTTTGACAGAAGATGAAGTGGTTAAAGCTGCTCT
CGGAGATCACATCTACACTAGCTTCCTTGAAGCCAAACGAATCGAATGGGCAAGTTATGC
AACCTTCGTTTCACAATGGGAAATTCGAT

ORF Predictions:

ORF #	Start	End	Direction	Length
6	176	286	F	37 aa

[SEQ ID NO:] 3860830-6 ORF translation from 176-286,
direction F

VNVLTCKMGFEVEASHHEVAVGQHEIDFKYDEVLPCL*

Blastp and/or MPSearch Result:

Description:

Glutamine Synthetase SAGLNAR NCBI gi: 468507 NCBI gi: 47374 -
Staphylococcus aureus.

Assembly ID: 3860984

Assembly Length: 817bp

[SEQ ID NO:] 3860984 Strep Assembly -- Assembly
id#3860984

ATCGAATTTATCCGTAAGACCATTCAGCACTTGGCAAGTAATGGGTGTGATTTGATTCGT
CTAGATGCCTTTGCTTATGCAGTGAACGAAATTGGATACTAATGATTTCTTTGTGGAACC
AGATATTTGGGATTTATTGGACAAAGTTCGAGATATCGCTGCTGAGTATGGGACAGAGCT
TTTACCTGAGATTCATGAACACTATTCGATTCAGTTTAAAATAGCAGACCATGATTACTA
TGTTTATGATTTTGTCTTCCAATGGTGACACTTTTATACTCTTTACAGTTCAGAACAGA
GCGTTTGGCTAAGTGGTTAAAGATGAGCCCGATGAAGCAATTTACGACGCTAGATACCCA
TGATGGGATTGGAGTAGTAGATGTCAAGGATATCCTGACCGATGAGGAGATTGACTATGC
TTCAAATGAACTCTATAAGGTTGGAGCCAATGTCAAACGTAAGTACTCTAGTGCCGAGTA
TAACAACTTAGATATCTTACCCAAAATCAATTC AACCTAACTTATTCAGCGCTTGGAGAT
GATGATGTCAAGTATTTTCTCGCTCGTCTAATTCAAGCTTTTGCCCCAGGTATTCCTCAG
GTTTACTATGTGGGTCTATTAGCAGGCAAGAATGACTTGAAATTATTAGAAGAACTAAA
GAAGGTCGAAATATTAATCGTCATTACTATAGCAACGAGGAAATAGCAAAAAGAGTGCAA
CGACCTGTTGTGAAGGCCCTTCTCAATCTATTTTCTTTCCGTAACCGTTCAGAAGCCTTT
GATCTAGAAGGGACTACTGAGATAGAGACACCAACAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	113	520	F	136 aa

[SEQ ID NO:] 3860984-6 ORF translation from 113-520,
direction F

VEPDIWDL LDKVRDIAAEYGT ELLPEIHEHYSIQFKIADHDYVYDFALPMVTLYTLYSS
 RTERLAKWLKMSPMKQFTTLDTHDGIGVVDVKDILTDEEIDYASNELYKVGANVKRKYSS
 AEYNNLDILPKINST*

Blastp and/or MPSearch Result:

Description:

sucrose phosphorylase (EC 2.4.1.7) - Streptococcus mutans

Assembly ID: 3861088

Assembly Length: 556bp

[SEQ ID NO:] 3861088 Strep Assembly -- Assembly
 id#3861088

ATCGAATTTGCTCTAATAACAAGTTTTTTGGTCAAAGACCCCGTCTTAGTGGGAAGCATC
 CCCATTCCAGATGGAGTTTTTCACGATCACATAATCAACGTGTTTAAGGTCAGCAACCTG
 ACGTCCACCTGCATAAGAAATAGCACTTTGAAGGTCTTGTTCCATCTCAGTTAAAGTGTC
 TTGCAGATGACCTTTAGCAGGAAGCAAGATACGTTTGCCTCCCACATTTTTTGTAAGCACC
 TTTTGTATATTGTGAGGCTGAACCATAATATCCTCTGAACTGTCCACCATCGACTTCAAT
 CGTTTCCCCTGGACTTTCAATGTGTCTGCAAAGAGGGAACCAATCATGATCATGCTAGC
 ACCGAAGCGGATAGACTTAGCAATATCACCGTGAGTACGAATTCCTCCATCAGCGATAAT
 CGGTTTACGCGCAGCCTTGGCACACCAGCGTAAGAGCAGCCAACCTGCCAACCACCTGTTA
 CCAAAACCAGTCTTAACCTTGGTGATACAAACCTTACCAGGACGGATTCCGACCTTAGTA
 CCATCCGCACTAGCAT

ORF Predictions:

ORF #	Start	End	Direction	Length
6	46	474	R	143 aa

[SEQ ID NO:] 3861088-6 ORF translation from 46-474,
 direction R

VVGSWLLLRWCAKAARKPIIADGGIRTHGDIKSIKSGMIMIGSLFAGHIESPGETIE
 VDGGQFRGYYGSASQYQKGAYKNVGGKRILLPAKGHLQDTLTEMEDLQSAISYAGGRQV
 ADLKHVDYVIVKNSIWNGDASH*

Blastp and/or MPSearch Result:

Description:

inosine-5'-monophosphate dehydrogenase (guaB) homolog -
Haemophilus influenzae (strain Rd KW20)

Assembly ID: 3861138

Assembly Length: 528bp

[SEQ ID NO:] 3861138 Strep Assembly -- Assembly
id#3861138

AAAAAGCCAGAGGAGTGTGAGGAAGTGGAAAATCGAAAATTGTGAAGGATATCTTATTTT
TATCTCAAGTGTCTCAGCCGGCAAGTCAGGAGGACCTTTATCTTGCCAGAGATTTGCAGG
ATACACTCTTAGCAAATCGTGATACCTGTGTTGGTCTAGCTGCCAATATGATTGGGGTGC
AGAAGCGCGTGATTATCTTTAATCTTGGCTTAGTTCCCGTGGTCATGTTTAACCCAGTGC
TTCTGTCTTTGAAGGATCTTATGAGGCAGAAGAAGGCTGTTTGTCTTGGTAGGTGTGA
GATCAACTAAGCGTTATGAAACCATAAGGCTTGCCTATCGTGACAGCAAGTGGCAGGAAC
AGACCATTACCTTGACAGGCTTCCCAGCTCAGATTTGCCAGCATGAGCTGGATCACTTGG
AAGGACGAATCATTTAGGAAGGAAAGCAAATGAAACGAATAGTCTTTGAACTTATTTTTA
TCGCAACGACCTGGGTATATCTTTTTACCGCCCCCTTAACCTGACCAGC

ORF Predictions:

ORF #	Start	End	Direction	Length
6	42	437	F	132 aa

[SEQ ID NO:] 3861138-6 ORF translation from 42-437,
direction F

VKDILFLSQVSPASQEDLYLARDLQDTLLANRDTCVGLAANMIGVQKRVIIFNLGLVPV
VMFNPVLLSFEGSYEAEEGCLSLVGVRSTKRYETIRLAYRDSKWQEQTITLTGFPAQICQ
HELDHLEGRII*

Blastp and/or MPSearch Result:

Description:

fms protein homolog - *Thermus aquaticus* (fragment)

Assembly ID: 3861256

Assembly Length: 638bp

[SEQ ID NO:] 3861256 Strep Assembly -- Assembly
id#3861256

CTTAGGTCATTTTTTAAAATTCAAATTCGCAAGAACATCTTGCCCACTGGTGACCAATTT
TGCTCCTTCTTGAATCAAATGATGGCAACCGTCTGATAGTCCATCTAAAATGCTACCAGG
AATAGCAAAGATATCGCGTCCTTCTTCCATTGCTCGCTCACAGGTAATGAGACTACCTGA
ACGCATCTTAGCCTCTGCTACAATCACACCACGACAAAGTCCAGCAATGATGCGATTACG
GGCAGGAAAAATCGAAATTCAGAGGTTGTTTCGCCAGATCCATATTTCACTTAGAGCCAGAT
GGTCATTGCCGATGTAGTCTTGCAAGCGTTTGTGGCTTTAGGATAAAACACATCCAGTC
CTGTTCCAATCACTGCAATGGTTTTTTCGCCATTCTGAAAAGCTGCCATATGAGCTGCTG
TGTC AATGCCCTTGCCAGACCACTGACAATAACCAGTTCATTTTCCAAGCCTTGAATGA
CTTTTTCAACTGACTTAGCTCCCTGTTTGCTACAAGCACGAATGCCCACGAACGCTACCT
TCCGGAATTTCAAGGAAGGTCAAGATTTCCCTTGTTAAAATAAAAATACAGGCGCATC
ATATTATTTCACTCCAAATCCCCAAGGGATAACAAGTC

ORF Predictions:

ORF #	Start	End	Direction	Length
6	13	207	R	65 aa
7	236	529	R	98 aa

[SEQ ID NO:] 3861256-6 ORF translation from 13-207,
direction R

VIVAEAKMRSGSLITCERAMEEGRDIFAIPGSILDGLSDGCHHLIQEGAKLVTSGQDVLA
EFEF*

Blastp and/or MPSearch Result:

Description:

SMF PROTEIN. - ESCHERICHIA COLI.

[SEQ ID NO:] 3861256-7 ORF translation from 236-529,
direction R
VGIRACSKQGAKSVEKVIQGLENELVIVSGLAKGIDTAAHMAAFQNGGKTIIVIGTGGLDV
FYPKANKRLQDYIGNDHLLALSEYGSGEQPLKFRFSCP*

Blastp and/or MPSearch Result:

Description:

SMF PROTEIN (FRAGMENT). - BACILLUS SUBTILIS.

Assembly ID: 3861262

Assembly Length: 1727bp

[SEQ ID NO:] 3861262 Strep Assembly -- Assembly
id#3861262

NCAAAAAATGTAGTGATTACGGGAGCAACTTCAGGAATCGGGAAGCGATTGCGCGTGCTT
ATCTGGAGCAGGGTGAGGATGTCGTTCTAACAGGACGACGGATAGACAGATTAGAAAATCC
TTCAAGTCGGAGTTTGCAGTAAGCTTTCCAAATCAAACCGTCTGGACTTTTCCACTAGAT
GTGACGGATATGGTCATGGTGAAGACTGTTTGCTCTGATATTCTAGAAACGATAGGGAGG
ATTGATATCTTGGTCAACAACGCCGACTGGCTCTTGGCTTGGCTCCCTATCAAGACTAT
GAGGAGTTGGATATGTTGACCATGTTGGATACCAATGTTAAAGGTCTGATGGCGGTTACT
CGCTGTTTCTTGCCAGCAATGGTAAAAGTCAATCAAGGTCACGTTATCAATATGGGGTCA
ACCGCAGGAATCTACGCCTATGCTGGTGCCGCTGTTTACTCAGCTACCAAGGCTGCGGTT
AAGACCTTTTTCGGATGGACTGCGAATTCGATACCATCGCAACGGATATCAAGGTGACAAC
CATTCAGCCTGGGATTGTGCGAAACAGATTTCTCAACTGTTTCGTTTTTCATGGTGATAAAGA
GCGGGCTGCGTCCGTTTACCAAGGAATAGAAGCCTTGCAAGCTCAGGATATTGCAGACAC
AGTAGTCTATGTGACCAGTCAGCCTCGCCGTGTTTCAGATTACAGATATGACCATTATGGC
CAATCAACAGGCGACAGGTTTCATGATTCATAAAAAATAAGAAATTTCTCGAAAAGTTA
CAAATTTCTGTAACCTTTTTTGTATTTCCTACGAATAGATAAGTAGGAGGAAGAAAATATGT
ATAATAAAGTTATCATGATTGGGCGTTTAAAGTCTACACCAGAATTGCACAAAACCAACA
ATGACAAGTCGGTAGCGCGAGCAACTATCGCTGTGAACCGTCGTTACAAAGACCAAAACG
GTGAACGTGAAGCTGATTTTGTTCATATGGTCCCTATGGGGCCAGAACTAGCCAGAAAA
CTTTGGCAAGCTACGCAACCAAAGGTAGTCTCATTTCCGTTGATGGAGAATTGCGTACCC
GTCGCTTTTGAGAAAAATGGCCAAATGAACTACGTGACCGAAGTACTTGTCACAGGATTCC
AACTCTTGGAAGTCGTGCTCAACGTGCCATGCGTGAAAATAATGCAGGCCAAGATTTGG

CAGATTTAGTCTTGGAAGAAGAAGAATTGCCATTTTAATACTCTTCGAAAATCTCTTCAA
 ACCACGTTAGCTTTATCCACAACATCAAAGCAATGCTTTGAGCAGCCTGCGGCTAGCTTC
 CTAGTTTGCTTTTTGATTTTTATTGAGTGTTAGTTACTTGATAGCTTCGACCAAGTCTTG
 AGCTTGTTTTTCAAGTGAGTTTAGGACTGTTTCTTCAAGAACCAATTTTCCGTCTGCCCA
 GGCAGAGTCATTAACACGTGCAGCAGTGAAATCACCAACGCCTTGTGTACGGATAAAATGG
 CAAGAGGTCTTTGTAGATAGCGAAAAGTTGATCGTGCCCTGCATTGGCTACAGATGATAC
 TGTGACAAACTTGTCTTGAAGGGCAGAAACGCCACGTGTATCAGACAAGTCAAGGGCAGC
 AGATAGCCAGTCAAGCAAGTTTTTCACTGTACCAGGGATAGAGAAGTTGTAGACTGGAGA
 GAAAATCCAGATAGCATCCGCAACGAGAACTGCTTCACGAGCAGCAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	181	594	F	138 aa

[SEQ ID NO:] 3861262-6 ORF translation from 181-594,
 direction F
 VTDMVMVKTVCSDILETIGRIDILVNNAGLALGLAPYQDYEELDMLTMLDTNVKGLMAVT
 RCFLPAMVKVNQGHVINMGSTAGIYAYAGAAVYSATKAAVKTFSDGLRIRYHRNGYQGDN
 HSAWDCRNRLNCSFSW*

Blastp and/or MPSearch Result:

Description:

HYPOTHETICAL OXIDOREDUCTASE IN DCP 3'REGION (FRAGMENT). -
 ESCHERICHIA COLI. (BLAST)

Assembly ID: 3864150

Assembly Length: 3808bp

[SEQ ID NO:] 3864150 Strep Assembly -- Assembly
 id#3864150
 AACTGGAACAAATATGGTTTTGTTCAAAACACCAATACCGTAAGGTTGACCGTGAAACAG
 GTGTTGTCACGAACGAAATTGTTTGGTTGACAGCTGATGAAGAAGATGAATATACTGTAG
 CTCAGGCTAACTCTCGTCTGAATGAAGATGGAACCTTTGCTGACAAGATTGTCATGGGAC

GTCACCAAGGGGTCAACCAAGAGTATCCAGCTAATATTGTTGACTACATGGACGTTTCAC
CAAAACAGGTAGTTGCCGTTGCGACAGCATGTATTCTTTCTTGAAAAACGATGACTCCA
ACCGTGCCCTCATGGGAGCCAATATGCAACGTCAGGCTGTGCCATTGATTAATCCTCAGG
CACCTTACGTTGGTACTGGTATGGAATACCAAGCAGCCACGATTCTGGTGCGGCTGTGA
TTGCTCAGTATGATGGTAAAGTTACTTACGCAGATGCTGACAAGGTAGAAGTTTCGTCGTG
AAGATGGTTCATTGGATGTTTACCACATCCAAAAATTCCGTCGTTCAAACCTCAGGTACTG
CTTACAACCAACGCACTCTCGTAAAAGTTGGTGATGTGCTTGAAAAAGGCGATTTCATCG
CTGACGGACCTTCTATGAAAAATGGAGAAATGGCGCTTGGAACAAAACCAATCGTTGCCCT
ACATGACTTGGGAAGGTTACAAC'TTCGAGGATGCCGTTATCATGAGCGAACGCTTGGTGA
AGGACGATGTCTACACATCTGTTACCTTGAAGAATACGAATCAGAAACGCGCGATACAA
AGCTTGGGCCTGAAGAAATCACTCGCGAAATTCCAAACGTTGGTGAAAGATGCCCTCAAAG
ACCTTGACGAAATGGGGATTATCCGTATTGGTGCTGAGGTTAAAGAAGGTGATATTCTTG
TAGGTAAAGTAACACCTAAGGGTGAGAAAGATCTTTTCAGCTGGAAGAAGCTCTCTTGAC
GCTATCTTTGGAGACAAGTCTCGTGAAGTGCGTGATACTTCTCTTCGTGTACCACACGGT
GCCGATGGTGTCGTTTCGTGATGTTAAGATCTTTACACGTGTAAATGGAGATGAGTTGCAA
TCAGGTGTTAACATGTTGGTTCGTGTTTACATCGCTCAAAAACGTAAGATTAAGGTCGGA
GATAAAATGGCCGGACGTCACGGAAACAAAGGGGTTGTCTCTCGTATCGTTTCTGTAGAA
GACATGCCTTACCTTCCAGACGGAAC'TCCAGTCGACATCATGTTGAACCCACTTGGGGTG
CCATCACGTATGAATATCGGTCAGGTTATGGAGCCTCACCTTGGTATGGCAGCTCGTACT
CTTGGTATTACATTGCGACACCAGTCTTTGATGGAGCAAGTCTTGAAGATCTTTGGTCA
ACTGTTAAAGAAGCAGGTATGGATAGCGATGCCAAGACAATCCTTTACGATGGACGTACA
GGTGAACCATTTGATAACCGTGTTTCTGTTGGAGTCATGTACATGATCAAACTCCACCAC
ATGGTTGACGATAAATTGCACGCGCGTTCAGTCGGACCTTATTCAACTGTTACCCAACAA
CCACTCGGAGGTAAAGCTCAGTTTGGTGGACAACGTTTTCGGTGAGATGGAGGTTTGGGCT
CTTGAAGCCTACGGTGCGTCAAAATGTCCTTCAAGAAATCTTGACTTACAAGTCTGACGAT
ATCAACGGACGTTTGAAGCCTATGAAGCTATTACAAAAGGCAAACCAATTCCAAAACCA
GGTGTTCCAGAAATCCTTCCGAGTTCCTTGTCAAAGAATTGCAATCTCTTGGTCTTGACATG
CGTGTCCTAGACGAAGATGACCAAGAAGTGGAAC'TTCGCGACTTGGATGAAGGAATGGAC
GAAGATGTCATCCACGTAGATGACCTTGAAAAAGCCCGCGAAAAAGCAGCCCAAGAGGCT
AAAGCAGCCTTTGAAGCTGAAGAAGCTGAGAAAGCAACAAAAGCGGAAGCAACAGAAGAA
GCTGCTGAACAAGAATAAGCAGTTCACCTTAGAATAGAAAGGGAAGAAATAGTGGTTGATG
TAAATCGTTTTAAAGTATGCAAATCACCTTAGCTTCTCCAAGTAAAGTCCGTTTCATGGT
CTTATGGAGAAGTCAAAAAACCTGAAACAATCAATTACCGTACCTTGAAACCAGAACGTG
AAGGACTCTTTGATGAAGTGATCTTTGGTCTTACAAAAGACTGGGAATGTGCTTGTGGTA
AGTACAAACGCATTTCGTTACAGAGGAATTGTTTGTGACCGCTGTGGGGTTGAAGTAACGC
GTACGAAAGTTCGTGCTGAGCGTATGGGACATATCGAATTGAAAGCTCCTGTATCTCACA
TCTGGTACTTCAAGGGGATTCCAAGCCGTATGGGCTTGACCCTTGATATGAGCCCTCGTG
CCCTCGAGGAAGTTATCTACTTTGCGGCTTATGTGGTGATTGATCCTAAGGATACACCAC
TTGAGCACAAGTCTATCATGACAGAGCGCGAATACCGAGAGCGCTTGCGTGAATATGGTT
ATGGTTCAATTTGTTGCTAAGATGGGTGCGGAAGCCATCCAAGACCTTTTGAAGCAAGTAG
ATCTTGAAAAAGAAATTGCTGAACTCAAGAAGAAATTGAAAAC'TGCTACTGGACAAAAC
GTGTCAAAGCCATCCGTCGTTTGGATGTTTGGATGCCTTTTACAAGTCTGGAAACAAAC
CTGAATGGATGATTCTTAACATCCTTCCGGTTATCCCACCAGATCTTCGTCCAATGTAGC

AGGAATTCGATGGTGGCCCGTTTTGCCTCATCTGACTTGAATGACCTTTACCGCCGTGTT
 ATCAACCGTAACAACCGTTTTGGCTCGTTTGCTTGAGTTAAATGCACCAGGTATCATCGTT
 CAAAATGAGAAGCGTATGCTTCAAGAAGCAGTTGACGCTTTGATTGACAATGGTCGTCGT
 GGTCGTCCAATCACAGGACCAGGTAGCCGTCCATTGAAATCATTGAGCCACATGCTTAAA
 GGTAAACAAGGACGCTTCCGTCAAAACTTGCTCGGTAAACGTGTTGACTTCTCAGGACGT
 TCCGTTATCGCCGTTGGTCCAACCTCTTAAGATGTACCAATGTGGTGTGCCACGTGAAATG
 GCGATTGAACTCTTTAAACCATTGTGTCATGCGTGAAATCGTTGCCCCTGATATCGTGCAA
 AACGTCAAAGCAGCTAAACGCTTGGTGGAAACGCGGAGATGAGCGTATCTGGGATATCCTT
 GAAGAAGTGATTAAAGAACACCCAGTGCTTTTGAACCGCGCACCGACCCTTCACCGTTTG
 GGTATCCAAGCCTTCGAGCCAGTCTTGATTGATGGTAAGGCTCTTCGCTTGACCCACTT
 GTC'TGTGAAGCCTACAATGCTGACTTTGACGGGGACCAAATGGCCATCCACGTACCACTT
 TCAGAAGAAGCACAAGCAGAAGCTCGTATCCTCATGCTAGCTGCTGAGCACATCTTGAAC
 CCGAAAGATGGGAAACCGGTAGTTACTCCATCTCAGGACATGGTTTTGGGTAACACTACTAC
 TTGACCATGGAAGAAGCTGGTCGCGAAGGTGAAGGAATGGTCTTCAAAGACCGTGACAAA
 GCGGTTATGGCTTACCGCAATGGTTATGTTACCTCCACTCACGTGTTGGTATCGCAACA
 GACAGCCTCAACAAGCCTTGGACAGAAGAGCAAAGACATAAGGTCTTGCTTACAACAGTT
 GGTAAAATTCTCTTCAACGATATCATGCCAGAGGGGCTACCATACTTGCAAGAACCAAAC
 AATGCCAACTTGACAGAAGCTGTTCCAG

ORF Predictions:

ORF #	Start	End	Direction	Length
7	922	1998	F	359 aa
8	2031	2759	F	243 aa

[SEQ ID NO:] 3864150-7 ORF translation from 922-1998,
 direction F

VRKIFQLEERLLHAIFGDKSREVRDTSRLRPHGADGVVRDVKIFTRVNGDELQSGVNMLV
 RVYIAQKRRIKVGDKMAGRHNKGVSRIVPVEDMPYLPDGTVPDIMLNPLGVPSRMNIG
 QVMEPHLGMAARTLGIHIATPVFDGASPEDLWSTVKEAGMDSDAKTILYDGRTGEPFDNR
 VSVGVMYMIKLHHMVDDKLHARSVGPYSTVTQQLGGKAQFGGQRFGEDEVWALEAYGAS
 NVLQEILTYKSDDINGRLKAYEAITKGKPIPKGPVPEFRVLVKELQSLGLDMRVLDEDD
 QEVELRDLDEGMDEDVIHVDDLEKAREKAAQEAKAAFEAEAEKATKAEATEEAAEQE*

Blastp and/or MPSearch Result:

Description:

DNA-DIRECTED RNA POLYMERASE BETA CHAIN (EC 2.7.7.6)
 (TRANSCRIPTASE BETA CHAIN) - BACILLUS SUBTILIS.

[SEQ ID NO:] 3864150-8 ORF translation from 2031-2759,
direction F
VVDVNRFKSMQITLASPSKVRSWSYGEVKKPETINYRTLKPEREGLFDEVIFGPTKDWECA
ACGKYKRIRYRGIVCDRCGVEVTRTKVRRERMGHIELKAPVSHIWYFKGIPSRMGLTLDMS
SPRALEEVIYFAAYVVIDPKDTPLEHKSIMTEREYRERLREYGYGSFVAKMGAEAIQDLL
KQVDLEKEIAELKEELKTATGQKRVKAIRRLDVLDAFYKSGNKPEWMILNILPVIPDLR
PM*

Blastp and/or MPSearch Result:

Description:

DNA-DIRECTED RNA POLYMERASE BETA' CHAIN (EC 2.7.7.6)
(TRANSCRIPTASE BETA' CHAIN) (FRAGMENT). - BACILLUS
SUBTILIS.

Assembly ID: 3864190

Assembly Length: 2753bp

[SEQ ID NO:] 3864190 Strep Assembly -- Assembly
id#3864190

ACCCGCTTTTCAGAACTTAAACAGATTGCGGATGTATTTGTAAATGGCAATCTATCTCTAG
AAGTTCAGTGTAGTCCCTTGCCCTCAGAAAGTCCTTAAAGAGCGAAGTGAGGGCTATCGTA
GTCAGGGTTACCAAGTACTGTGGTTGCTGGGTCAAAAACCTGTGGCTCAAGGAGCGTTTGA
CTCGTCTACAGCAAGGTTTTCTTTATTTTCAGTCAAAACATGGGCTTTTATGTTTGGGAAT
TAGACAAGGAAAAACAAGTTTTAAGACTCAAATACCTGATTTACCAGGATCTCCGCGGTA
AACTCCATTATCAAAATCAAGGAATTTTCCTATGGTCAAGGTAGTTTATTGGAAATATTGC
GTCTTCCCTATAAGAGACAAAAAATATCTCATTTTACAGTTTCTGAGGACAAGGACATCT
GTCGCTATATCCGGCAACAACCTTTATTATCAAAATCTCTTTTGGATGAAAGAACAAGCAG
AAGCCTATCAAAAGGGAGAAAAATATCCTGACTTATGGACTGAAAGAATGGTATCCACAAA
TTCGACCAATAGTGGGCAAATTTTTCAGATTGAACAAGACTTGACTAGCTATTATCAGC
ACTTTTATACCTATTACCAAAAAAATCCTCAAAATGATTGGCAAAGCTTTATCCACCAG
CCTTTTATCAGCAATATTTCTTGAAAAATATGGTAGAATAGAAAGGATGGAGGAATCTAA
TGGTATTACAAAGAAATGAAATAAATGAAAAAGATACATGGGATCTATCAACGATCTACC
CAACTGACCAGGCTTGGGAAGAAGCCTTAAAAGATTTAACAGAACAATTGGAGACAGTAG
CCCAGTATGAAGGCCATCTCTTGGATAGTGCGGATAACCTACTAGAAATCACTGAATTTT
CTCTTGAAATGGAACGCCAGATGGAGAAGCTTTACGTTTATGCTCATATGAAGAATGACC

AGGATACACGTGAAGCTAAGTATCAAGAGTACTATGCCAAGGCCATGACACTCTACAGCC
 AGTTAGACCAAGCCTTTTCATTCTATGATCCTGAATTTATGGAGATTAGCGAAAAGCAGT
 ATGCTGACTTTTTAGAGCTCAACCAAAGCTGCAGGTTTATCAACACTATTTTGACAAGC
 TCTTGCAAGGCAAGGATCACGTTCTTTCACAACGTGAAGAAGAATTCGATTGGCTGGAGC
 TGGAGAAATCTTTGGTTCAGCAAGTGAAACCTTCGCTATCTTGGACAATGCGGATATTGT
 GTTCCCTTATGTCTTAGACGATGATGGTAAAGAAGTTCAGCTATCTCATGGGACTTACAC
 ACGTTTGATGGAGTCTAAAAACGTGAGGTTCCCGTGGTGCCTATCAAGCTCTTTATGC
 GACTTACGAACAATTCCAACACACCTATGCCAAAACCTTGCAAACCAATGTTAAGGTGCA
 AAATTCGATGCTAAAGTTCGTAACTACAAGAGTGCTCGTCATGCAGCTCTCGCAGCGAAT
 TTTGTTCCAGAAAGTGTTTATGACAATTTGGTAGCAGCAGTTCGCAAGCATTTGCCACTC
 TTACATCGCTATCTTGAGCTTCGTTCAAAAATCTTGGGGATTTCAGATCTCAAGATGTAC
 GATGTCTACACACCGCTTTCATCTGTTGAATACAATTTTACCTACCAAGAAGCCTTGAAA
 AAAGCAGAAGATGCTTTGGCAGTCTTGGGTGAGGATTACTTGAGCCGTGTCAAACGTGCC
 TTCAGCGAGCGTTGGATTGATGTTTACGAAAATCAAGGCAAGCGTTCAGGTGCCTACTCT
 GGTGGTCTTACGATACCAATGCCTTTATGCTTCTCAACTGGCAGGACAATCTGGACAAT
 CTCTTTACTCTTGTTTCATGAAACAGGTACAGTATGCATTCAAGCTATACTCGTGAAACT
 CAGCCTTATGTTTACGGAGATTACTCTATCTTTTTGGCTGAGATTGCCTCAACTACCAAT
 GAAAATATCTTGACGGAGAAATTATTGGAAGAAGTGGAAGACGACGCAACACGCTTTGCT
 ATTCTCAATAACTTCCTAGATGGTTTCCGTGGAACAGTTTTCCGCCAAACTCAATTTGCT
 GAGTTTGAACACGCCATTCACCAAGCAGATCAAAATGGGGAGGTCTTGACAAGCGATTTT
 CTAAATAAACTCTACGCAGACTTGAACCAAGAGTATTATGGTTTGAGTAAGGAAGACAAT
 CCTGAAATCCAATACGAGTGGGCTCGCATTCACACTTCTACTATAACTACTATGTATAT
 CAATATTCAACTGGCTTTGCGGCCGCCTCAGCCTTGCTGAAAAAATTGTCCATGGTAGT
 CAAGAAGACCGTGACCGCTATATCGACTACCTCAAGGCAGGTAAGTCGGACTATCCACTT
 AATGTCATGAGAAAAGCTGGTGTGATATGGAGAAGGAAGACTACCTCAACGATGCCTTT
 GCAGTCTTTGAACGCCGTTTAAATGAGTTTGAAGCCCTTGTTGAAAAATTAGGATTGGCA
 TAAATGGTTGAATCGTATAGTAAGAATGCTAACCATAACATGCGTCGTCCTGTCTCAA
 AGAAGAAATTGTAGACTTGATGCGTCAGCGTCAAAGCAGGTCACAGGTTTCTTGAAAGA
 ATTGGAAGACTTTGCCCGCAAGGAAAATATTCCTATTATTCCCCATGAAACGGTTGCTTA
 TTTCCGTTTTCTTATGGAAACCATGCAGCCTAAAAATATTCTGGAAATTCGAT

ORF Predictions:

ORF #	Start	End	Direction	Length
8	1259	1534	F	92 aa

[SEQ ID NO:] 3864190-8 ORF translation from 1259-1534,
 direction F

VFPYVLDDDGKEVQLSHGTYTRLMESKKREVRRGAYQALYATYEQFHQTYAKTLQTNVKV
 QNSMLKFVTTTRVLVLMQLSQRILFQKVFMTIW*

Blastp and/or MPSearch Result:

Description:

ligoendopeptidase F - *Lactococcus lactis*

Assembly ID: 3864204

Assembly Length: 2140bp

[SEQ ID NO:] 3864204 Strep Assembly -- Assembly
id#3864204

CCAGTTTTGGTTCTGCATGTTGTTGTAGGCAGGACGAGCGAGACGTTGGAAGTCTTCTTG
ATAAGCCAAGAGGCCCCAGATACGGTCTTTCTTATCCACTTCAAGACGGATGTAGAGTTG
GTCGCCCTTCTTAGGCCAGAGTTCCTTGAGCACAGGGAGAATATCGAGTGACAACAACGA
TTTCCTTGTCAGGAAGGCCTGTATCCACAAAGACACCCAAGTCCTTACGAACCTCTGTGA
CACGTCCCCAACCAAATTGGTCCTGAGTGGCAGTCACTTCTAAGGTTGTCAGGCGGAGTT
TTTGCTTCATATCCGTGTATGCAAAACCTTTGACCGTATCCCCCTACTGTATGTTGGCCCT
CTTCCTTAGCAAGAGCATAGGTTTGACCATCCTTTTGCACAAAGTAAAAACGGTCATTTT
CATCGATGATCAGTCCAACGATAAACTTGCAAGATTTGTATTTCATATTTCTTCTTTTCG
AATAAACTCAGCCAGCAATGCCAACTGAGTTTTTCTGTTTATTTTTAGACTTCCAAAAG
TTCTTTCTCTTTGTTAGCAGTCATGTCGTCGATGTGTTTAACAGCATCGTCTGTACTTT
TTGAATATCTTTTTCAAGAGTCTTCAATTCGTCCTCAGTGATTTCTTTTGCTTTTCTTG
TTTCTTAGCTTCGTCCATAGCATCGCGACGGATATTGCGGACAGCCACTTTAGCATTTTC
GCCGACCTTCTTCACTTCTTTAGCAAGGTCACGACGAGTTTCTTCTGTAAGAGCTGGGAT
AACCAAGCGAATCACAGAACCGTCATTAGCCGGTGTGATACCAAGATCAGAAGCGTTCAA
GGCACGTTTCGATGTCTTTCAATGAAGACTTGTCAAATGGTGTACCAACAAAACACGCGC
TTCTGGAATCGTAATTGAAGCGATTTGGTTAAGAGGAGTTTCGACTCCATAGTATTCTAC
ATGTACACGGTCAAGCAAGCTTGCAATTGGCACGACCAGCACGGATACCACCAAATTCACG
AGCAAGTGATTGGTGAGACTGGGTCATTCTCTCTTTAGCTTTTTCAATAATTACGTTAGC
CATATTCTTTCTTATTCTTTCTTTCGATATTATTTGAAACTGTTGTTCCGATATTTTCA
CCAAATACGACACGTTTGATGTTGCCTGATTGGTTCATGTTGAAGACAACCAAGTCAATG
TCGTTGTCCATTGAGAGGGTTGAGGCTGTTGAGTCCATGATACGAAGACCTTTGTTGATA
ACATCACGGTGGGTCAATTCTTCAAACCTTAACGGCTGTCTTGTCCTTCTTAGGATCGGCA
TTGTACACACCATCGACGCCATTTTTAGCCATGAGGATGGCATCTGCTTCGATTTACAGCT
GCACGAAGGGCCGCTGTTGTATCTGTGAGAAGTATGGTGAACCAATTCCAGCACCAAAG
ATAACGATACGGCCTTTTTCAAGGTGACGAAGGGCACGTCCACGGACATAAGGCTCTGCC
ACTTGTGTCATAGCAATAGCTGTTTGTACACGCGTATCAACCCCAACTGTTGCAATGAA
TCTGCCATCACAAGAGCATTACATAACAGTCCCAAGCATTCAGTGTAATCTGCCTGAACA

CGGTCCATACCTGCTTCTGCTGCAGGTTCTCCACGCCAGAGATTTCCCTCCACCAATAACA
 AGGGCAATTTGATACCTAAGCTATGAACCTCTTGAATCTCTTTGCGATTGTTTGAACCT
 GTTTGGATATCAATCCCTACGCCACGTTACCGGCAAGGGCTTACCTGATAACTTGATT
 AAAATACGTTTATACTTGGGATTGCGCATTTTCACTCTCCTTCTTTTCATCCTACCTATTT
 TATCACAATTTCTAAGATTTTTATAGTATCATGAACAATTCTTTCAAAAAAATTAGACAG
 TCAAAAAATTCCTCTAAGTCGGCAAGGGCACGCTCTGCAATTTTTTCATAACGAGCCTTCT
 TATCACGGATACGCTCGCCTTCCAACCTTGATGATCCCAAAATTGACATTCATTGGTT
 GGAAATGTTTGCTGTGCGCATGGGTAATGTAATGAGCTAAGCTTCCAATCGCTGTCGTCT
 CGGGGAAAATAACCTCGCTTTCTTCCTTTGAAGAGACGAG

ORF Predictions:

ORF #	Start	End	Direction	Length
8	1092	1835	R	248 aa

[SEQ ID NO:] 3864204-8 ORF translation from 1092-1835,
 direction R

VKMANPKYKRILIKLSGEALAGERGVGIDIQTVQTIKEIQEVHSLGIEIALVIGGGNLW
 RGEPAAEAGMDRVQADYTGMLGTVMNALVMADSLQQVGVDTRVQTAIAMQQVAEPYVRGR
 ALRHLEKGRIVIFGAGIGSPYFSTDTTAALRAAEIEADAILMAKNGVDGVYNADPKDKT
 AVKFEELTHRDVINKGLRIMDSTASTLSMDNDIDLVVFNMNQSGNIKRNVFGENIGTTVS
 NNIEEKE*

Blastp and/or MPSearch Result:

Description:

URIDYLATE KINASE (EC 2.7.4.-) (UK) (URIDINE MONOPHOSPHATE
 KINASE) (UMP KINASE) (SMBA PROTEIN). - ESCHERICHIA COLI.

Assembly ID: 3864212

Assembly Length: 2545bp

[SEQ ID NO:] 3864212 Strep Assembly -- Assembly
 id#3864212

CTCGCAGTTCTCCATAGCTAATTGCGCCAAACGTCCTGCCAAGGTTGAGTCTTGTCCTCC

CAGAAATCCCTAGAACAAAGGTTTTTAGGAAGGGATGTTTTTCAGATATCTTTTAAAGG
AAAATCAAATAGAACGACGGATTTCTTCCGGTGGGGCATCAATCACTGGGTTTGACAACC
CAGCTCTTGGATAATCGGTTTCTGGCAAACCTATTCGTCTTCTCCCTTTACCAAGGGCT
TCCTTGCGCATCTTATCAATCAAAGTCCATCTTATCTTGCCATACGTCACGCGCCAAATC
CACTGGATAGTGTGCGGATTGAGCACACGCTTAAACTCATCCCACAACCTTGTCAAATTC
CTTACGGGCATAATCCTGAATGTCAGTCAAACCTAGGCAAGTTGTAAACTAATATTCTCTC
TTTGAAGATATCCACCAAGAGAGGAACGGCATCAAAATTACGAACCGTCTTCTTGATGTA
TGTATAGGTGGGATGGAACATCTTGATTTCTGTTCATGTCGCTAATATCCACACCATCATA
AGTGATGTAGTCACCTTCTGACTTGCCTTTTTTCACGACTGGTAATGCGCCACACCTGCTT
CTTACCTGGCGTCGACACTTTTTCCGCATTATTAGACAGCTTAATCGTATTGCGCATCTG
GCCGTTTTTCATCTTCGATTGCAACAATCTTGTAACCGCCCCAAGAGCCGGCTGGTCATA
GGCTGTAATCAGCTTGGTACCCACACCCACAGACATCAATCTTGCCCTTTTGCATCTTGAG
GTTAAGGATGGTATTTTCATCTAGATCATTAGAAGCATAAATCTTAGCCTCTGGAAATCC
AGCCTCGTCCAGTTGCTGACGACTTTCTTAGAAATGTAGGCAATATCCCCAGAGTCAAT
CCGCACACCCATAAAGTTAATCTGATCACCCAGCTCACGCGCCACCTGAATGGCAGCTGG
TACACCGATGCGAAGGGTATCATAGGTATCCACAAGAAAGACACAATTCGATTTGTGGGT
CGCAGCGTAAGCCTTGAAAGCCTCATAGTCATTGCCATAAACCTGTACCAAGGCATGGGC
ATGGGTTCACAAAACAGGAATGTCAAAGAGCTTACCCGCACGCACGTTGCTGGTTCCATT
GGCGCCACCAATCACCGCTGCGCGTGTTCCAGATGGCCGCATCCATTTCTTGAGCCCGA
CGTGTCCCAAACCTCCATCAAGGGTTCATCTTCGATAACCAAACGAATACGAGTGCTTTGT
CGCCACCAAGGTCTGGTAGTTGACGATGTTCAAAAGAGCCGTTTCGACCAACTGACATTG
GGGTAGAGGTCTTCCACCTGCACAATCGGTTTCATTAGCAAAAACCAAATCCCCCTTCTTG
GGCAGAACGAACGGTCAACTCCAACCTGAAATTGCGAAGGTAATCCAAGAACGCCCCATG
ATAACCAAGCGACTCCAATAGGCTATATCACTATCTGAAAAACGCAAGTCTTCAAGATA
GTTCAACAATCTTTTCCAAACCTGCAAAAACCGCATAGCCGTTCTTAAAAGGCTGTTGGCG
GAAATACACCTCAAAGACCGCTTCTTATTGTAAATCCCTTGATCAAAGTAAACCTGCAT
CATGTTGATCTGGTACAAGTCCGTGTGCAATGTCAAACCTATCATCTGGATACATACTTTT
CCTACTTCCTTAGCTAGAAACCCATGAAAATTTTCAAGAACTTTCATGTATTCCAATAAA
TTAGTACTATTATATCACATTTTAGCTGGATTGAGAAAAGAGTAACAAGCTATTCTCCAC
TCTCCAATTCATCCATATCTTGTTCAAATTTTTTCTGAGCCCATTGCGCATAGCTCTTAA
GACCAAGATTGCCAATAAAGACCCACGGAAGGTAAATGACATAAGTAATGACCCAAGCAG
ACAGGTATTTAAAATTCAAAGGATTGTGCTGATAAATTTCTATGTTGAATTGATAATTCT
GCAACATCAAAAGAGCCGTAATAGCCAAGGTTAGGAAAAAACAACCCAAAATCGTAAAT
GAAAACGACTATAGTAGGTCACCTCCAGATAACGGGCACGATTGAAAAAGTAAATGTCC
CTATGATGATAACGATTAGCAGCATATTAGAATTAAAAAGGCTTGGTGCTAATACTGAAA
TGATATAAGATAGGAGCGACAAAGCAATGCAGATATAGAACTTTCAGAGCCCCGCTTTAT
TGAACAGTTGTTCTTCTCTTTTCGTCTAGTAATTGATAATAATAAAATCTATTTTTCATCT
TCTTCCTCCCAAAATAGTTGGTCTAGGGTTTTCCCTAAACATCTGCAAATAGACTGGCAG
AGCGAGAGACTGGGATTGTATTTTCCCGCTCTATCAAACCAATAGTCTGGCGTGTACCC
CCGACAGCCTCTGCCAGTTGACCTTGTGTTAAATCACGCTCTACCCGAGCTAATTTTAAT
TTTAAATTTTTAGCCACCTTCGTCCTCCTTATAGTTTAAATACTCATCTACGCTTAAAAA
ATCCAAAACCAACACAAGCTATCAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	256	1155	R	300 aa

[SEQ ID NO:] 3864212-6 ORF translation from 256-1155,
direction R
VIGGANGTSNVRAGKLFDPVGLGTHAHALVQVYGN DY EAFKAYAATHKSNCVFLVD TYDT
LRIGVPAAIQVARELG DQINFMGVRI DSGDIAYISKVVRQQLDEAGFPEAKIYASNDLDE
NTILNLKMQKAKIDVWGVG TKLITAYDQPALGAVYKIVAIEDENGQMRNTIKLSNNAEKV
STPGKKQVWRITSREK GKSEGDYITYDGVDISDMTEIKMFHPTTYTYIKKTVRNFD AVPLL
VDIFKEGILVYNLPSLTDIQDYARKEFDKLWDEFKRVLNPQHYPVDLARDVWQDKMDFD*

Blastp and/or MPSearch Result:

Description:
unknown

Assembly ID: 3864214
Assembly Length: 3655bp

[SEQ ID NO:] 3864214 Strep Assembly -- Assembly
id#3864214
ACTTGATTAACAAATTTAACCTGCTAACTGCATCCAACGAATTCCTGGATCTTTAGCTTG
GTTGCTTCCTCCCTGCCATGGCCATGTCTGGTTTACCACCACCACGTCCATCGATGATTA
GTGCTAATTCTTTGACAAGGTTTCCTGCATGAAGGTCTTTTGTCTTGCTTGCTACAAGGA
CATTGACTTTGTCAACGATAGCGGCAACTAGGACAAGAAGATCAGAGTAGTCTTTTGT
TCCAGTTATCTGCAAAAGTACGAAGGGCACC GG CATCGGATACAGACACTTGACTAGCAA
TGTAACGATGACCGTTGACTTCCTTAACATCTTTGAAGATATCGCCTGCGGCTGCAGCTG
CGGCTTTTTCTTTCAACTCAGCATTTTCTTTTGAAGTTGACGAAGTTGTTCTTGAAGTC
CTTCTACCTTGTGAGGTACTTCCTTGACTTGAGGTGCTTTCAAGGTTGCTGCGACAGCTT
TAAGAGCATCCTCTTGTTACGATAGGCTTCAAAGGCTTCCTTACCAGTCACTGCCAAGA
TACGGCGAGTTCTTGAACCGATTCTTCTTTGACAATTTTGAAGAGACCAATCTCAG
AAGTGTTGCCAACATGAGTACCACCACAAAGTTCAATAGANTANTCACC GATAGTCACGA
CACGA ACTNCCTTGNCGTATTTCTCACCNNAGAGGGCNATANCTCCCATTTCTTTAGCAG

TGTCAATATCCGTTTCAACTGTCTTAACTTCAAGANCTTCCCAGATTTTTTCGTTGACTT
GCTGTTCAATCGCACGCAATTCTTCAGCAGTTACAGCTTGGAAGTGGGTAAAGTCAAAGC
GAAGGAATTCAACTTCGTTAAGAGATCCTGCCTGTGTTGCGTGGTTTCCAAGGATATTGT
GAAGGGCAGCGTGAAGCAAATGAGTCGCAGTGTGGTTTTTCATGACACGGTGACGGCGAT
TGCTATCAATTGCCAAGGTATATTCTTGGTTCAAGGCAAGCGGTGCAAGGACTTCAACTG
TATGAAGGGCTTGACCATTGGGGCTTCTGAACATTGGTTCACAGTAGCCACAACCTTAC
CTGACTCATCCAAGATTGTCCGTAGTCAGCTACCTGTCCACCCATTTTCAGCATAAAATG
ACGTTTCCGCAAAGATAAGAGAGGCAGTTCCTTCTGAAACAGCTTCTACTTCTGCATTGT
CCGCCACGATAGCTACCAATTTAGAAGACAATTGGCTAGCATTGTAGTTGAAGGCACTTT
CTACAGTGATGTTTTGAAGAGTTTCATTTTGCATACCCATTGAGCCACCCTTGACAGCTG
ACGCACGCGCGCGTTCTTGTGTTCTTTTCATGGCTGCTTCAAAACCTTCACGGTCTACAG
TCATACCAGCTTCTTCAGCGATTCTTCAATCGAATTCAACTGGGAACCCATAAGTATCA
TAGAGTTTGAAGACATCTGAACCAGCGATAACAGATTGACCTTTTTCTTTCAAGTCTGCT
ACAATGCCTTGGGCAAAGTGTGACCTGAGTGAAGGGTACGGGCAAATGATTCTTCTTCG
CTCTTAACGATTTTCTCAATAAAGTCACGTTTCTCAAGCACTTCTGGGTAGTAGCTTCC
ATGATTTTTTCCAACAGTTGGAACGAGTTTGTAAAGGAAAGGCTCGTTGATACCCAAATTT
TGACCATGCATAGAAGCACGACGGAGAAGACGACGAAGGACATAACCACGACCCCTCATTT
CCTGGAAGGGCACCATCACCGATGGCAAATGAAAGTGAACGGATGTGGTCAGCGATGACC
TTGAAGCTCATGTTGTCGCCATCTTGGTCATAAACCTTACCAGACAATTTCTCGACTTCA
CGGATAATCGGCATGAAGAGGTCCGTTTCAAAGTTGGTCTTAGCCCCCTTGGATAACGGCC
ACCAAACGCTCCAAACCAGCGCCCGTATCAATGTTCTTATGTGGCAATTCCTTGTATTCG
CTACGAGGAACAGCAGGGTCTGCGTTAAATTGTGACAAAACGATGTTCCAGATTTCAATA
TAACGGTCGTTTTTCAATATCTTCTGCAAGCAGGCGAAGACCGATATTTTCTGGGTCAAAG
GCTTCCCCACGGTCAAAGAAGATTTCTGTATCTGGTCCAGAAGGTCCCGCACCAGATTTCC
CAGAAGTTGTCCTCAATTGGAATCAAGTGACTTGGATCCACTCCCACTTCAATCCAGCGG
TTGTAAGAATCTTTATCGTCTGGATAGTAGGTCATGTAAAGTTTTTTCAGCAGGGAAATCA
AACCATTTCAGGGCTTGTCAAAGGCTCATAAGCCCAAGTGATAGCTTCGTACGGAAGTA
ATCCCCGATAGAGAAGTTCCCCAACATTTCAAACATGGTATGGTGACGCGCAGTCTTTCC
CTAACGTTTTTCGATGTCGTTGGTACGGATAGCCTTTTGGGCATTGGTAATACGTGGATTT
TCAGGGATAATGGTCCCGTCAAAGTATTTCTTAAGGGTTGCTACCCAGAGTTGATCCAC
AAAAGAGTTGGGTCATTTACAGGAACCAAACCTTACTGATGGTTCTACTGAGTGACCTTTG
GTCGCCCAGAAATCAAGCCACATTTGGCGTACTTGTGCACTAGATAGTTGTTTCATATTG
TCTCCTTATTCACTTGTTTAATGTGATTGGCTTTCCAGTATTTCCACATAGTCAATCGCG
ACACAGAGGGAAATGACTAGGTCTGCATAAGCGTCTTCAAGAACCGTTACGGTATAGGTA
GAGGTCAGATGGAAGAGTTCCTTCTTAATTTCCGCAATCAACTGATCGCGATCATCCAGC
GAATTTGAAATTCAAATCCAGATATTGCCCTCGATACGAAGACCTAGATTATCAAACCTC
ATACTTATCTCGCCAAAAGGTCAACTTCTTACGAATGACAAAACTCGAGCCATCCCGAAG
CTGAATCTCAAACGAGGAAGCAAGGTCAAGATTTCTTTACTGATCTGACTGACTTGTTT
ACCAGCCGCATCATAGATGGTAAAAGTTTTGGGAATCTTAAAAAATGATCCCTCCACCTG
ATAGGCAATTTCTCCCTGTTCATCCTTGATAGCGAAGCGTTTCGCTCCAAGACGAACTT
TTGTTTGACAAGAAATGTTTTTCATCAACACCTCCAAAAATCAAAGACAAGCTCATATCA
CGAAGGGCGAAAAACCGCGGTACCACCTTCATTCAATGAACTTGTCAATCTCTTGTCTT
ATGCAATTGTATGATTGAGTAGCATGACTTCTTAGCTTAGATGGCTCGCAGCACCGCCAT

TTCTCTGGACTAAGACAAGTGATATTTCCGCCAAACTTGGTCAATTTACGGGTCAAGTCC
 TCGCCTTTCTTGAGGGCACCAGGACTAGTATATGGTGGACTAGCAAAGTGAAGTGCCTCG
 ATATCCACCCCCACGCTTAAGAGCAAGATAACCTGCTACAGGTGAGTCAATCCCTCCTGAC
 AACATGAGCATCCCTTTACCTGAAGTTCCAACCTGGCAAACCACCAGCCCCACGAATGGTT
 TCCATAAGAAAGATAGGCTGCTTCTTCCACGAATCTCCACCCTGAAGATTGATGTCCAGG
 ACTTTTCCATTTTGAAGTTGCACATTTGGAATGGCTTCCGAATACAGCCCCCTCCA

ORF Predictions:

ORF #	Start	End	Direction	Length
9	2812	3150	R	113 aa

[SEQ ID NO:] 3864214-9 ORF translation from 2812-3150,
 direction R
 VLMKTFVLVKQKFRLLGGERFAIKDDRGEIAYQVEGSFFKIPKTFFTIYDAAGEQVSQISKEI
 LTLPRFEIQLRDGSSFVIRKKLTFWRDKYEFNGLGLRIEGNIWDLNFKFAG*

Blastp and/or MPSearch Result:

Description:
 unknown

Assembly ID: 3864226
 Assembly Length: 2901bp

[SEQ ID NO:] 3864226 Strep Assembly -- Assembly
 id#3864226
 ATCGAATTTTATTGACAGATTAGAAAAATAATGTTACATTTATATCCGCAGGTATCTTTC
 GATACCAAATCTACATGAAGGGACGGGGTATGAACTTTCTCATTATTTAATTGGCTTAC
 TTCTACTCCTAGTCTTTCTCTCTATTAGCATTGGGACCAGTGATTTTTCATGGGGAAAGC
 TATTTGATTTTCGACCAGCAGACCTGGCTCCTCTTTCAAGAGTCCCGTCTCCCAAGAACTA
 TCAGTATTCTCCTGACTGCCTCTAGTATGAGTATGGCAGGCCTTCTCATGCAGACTATTA
 CCAAAAATCAGTTTGCTGCACCGAGTACAGTTGGAACGACTGAAGCCGCCAAACTGGGAA
 TGGTGCTGAGCCTTTTTGTCTTTCCATCGGCTAGTCTGACCCAAAAGATGCTCTTCGCTT
 TTGTTTCATCCATCGTATTCACCCTCTTCTCCTAGCCTTATGACCATTTTTACTGTAA

AGGAAAGGTGGATGTTGCCTCTGATTGGGATCATCTATAGCGGGATTATCGGCTCAGTCA
CAGAAGTTATCGCCTATCGTTTCAATCTGGTTCAGAGTATGACTGCCTGGACCCAGGGCT
CCTTCTCCATGATTAGACCCATCAGTATGAGTGGCTCTTCTTAGGCCTCATCATCCTGA
TAACCGTTTGGAAATTATCCCAAACCTTCACCATCATGAATCTAGGGAAAGAAACCAGCG
AGAGTTTGGGGATTTCCTACTCCCTACTTGAAAACTGGCCCTCTTCTGGTGGCGCTAA
CGACAAGCGTCACCATGATTACCGTGGGGGGCCTACCATTTCTCGGAGTTATCGTTCCCA
ATCTTGTTTCGCAAGCGCTATGGAGATAATCTAAGTCAAACCAAACCTCATGGTCGCACTGG
TTGGTGGCAATCTAGTTCTGGCTTGCGATATCCTATCCCGAGTTCTGATTAGGCCCTATG
AGTTGTCTGTCTAGTCTCTTGCTAGGAATCATCGGTAGTCTCGTCTTTATCCTACTTCTCT
GGAGAGGGGGACGAAAAGATGCAGACTAAAAGCAAACATACCAAGCTCTTCTGGATTCTC
ATTATTTCTTGCCATCGGAGCTTGTCTTCTCTACTTTTGGCCCATCACTCACTTGTCTAGCC
TTTGCTTGGAAGTTGCGTTCCCAAAGATCATCGTTTATCTCTTGGTAGCCATCGCGACT
GGGATTTTCGACCATTAGTTTTCAAACCCTGACGGAAAAATCGCTTCTGACGCCCTAGTATT
TTAGGAATTGAATCCTTCTACGTCTCTACTACAAACCCTACTACTGGTTTTTGAAGCAAG
TTTCTTCAACTTGGCAAATCCCCTATCTTAGAATTCTTAGTCTTACTTCTTGTCCAGTCC
CTCTTCTTTCTCGCCTTACAAGGTTACTTGAAGACACTGATGAAGCAAGACCTGGTCTTC
ATCCTGCTGATCTGTCTAGCGCTCAGAAGTCTCTTTCGAAATATCAGCACCTTCTTTCAA
GTCTTAATGGATCCAAACGAATACGATAAACTGCAAAATAGTCTTTTTGCTCCTTTCAA
CATCTCAACACTTCCATCCTAGCCATCGGTTCTCTGATCATCCTCGCTTTGACAATCTTT
TTCTTTCGAAAAGCAGTCGTTCTAGATGTCTTGACCTGCAAAGAGAAACGGCTCAGATA
TTGGGACTCGATGTTGAAAAGAAGAGAAAGAGCTCCTCTGGGGAATCGTGCTTTTGACC
TCAACGGCCACTGCCTTGGTAGGACCTATGGCCTTCTTCGGCTTTATGCTGGCCAACCTC
ACCTACCTGATTGTCAAAGACTATCAGCACAAAGTTACTCTTTATAGTGGCCATTCTGGTT
GGATTTATTTAGCTTAACCTTGGGGCAAGCCTTGATTGAACGAGTCTTTGCACTGGAAATT
CGTATCAGTATGATCATTGAGAGTGTGGGTGGCTTCTTATTCTTTATCTTACTATATAGG
AGGTCTCGTCAGTGAACTGGAAAACATTGACAAATCCATTCAAAAACAGGATATTTTGC
AAGGCATTTTCGCTTAAAGTCAGTCTTCAAAAAGTACTGCCTTTATTTGGTCCAAATGGTG
CTGAAAAATCGACTCTCCTCTCCATCATGAGCAGACTAACCAAGAAAGATCAGGGAGTTC
TCAGTATCAAAGGACGTGAAATCGAGAGCTGGAATTCGCAAGAACTGGCTCAAGAACTAA
CCATCCTTAAACAGAAAATCAATTACCAAGCCAAATTGACTGTTGAAGAACTGGTCAGTT
TTGGACGTTTTCCCTACAGCCGAGGTCGACTTAGATCAGAAGACTGGGAAAAATCCGAG
AAACTCTGAACTATTTGGAACGTGACCAACTTAAAAGACCGCTACATCAATAGCCTGTCAG
GGGGGCAACTCCAGCGCTCTTTATCGCTATGGTACTGGCCCAGGATACGGACTTTATCT
TGCTGGACGAACCACTCAACAATCTCGATATCAAGCAAAGCGTCAGCATGATGCAGATTC
TTTCGACGACTGGTGGAGGAACTCGGCAAGACCATTATCATCGTCTCCACGATATCAACA
TGGCCAGTCAGTATGCAGATGAAATTGTGCGCTTCAAGGACGGCCAGGTCTTTAGCAAGG
GAAGAACCGATCAAATCATGCAGGCTGACCTACTCAGTCAACTTTATGAGATTCCCATCA
CGCTAGCTGATATCAATGACAAAAAGATCTGTATCTATAGCTAGTAACATAAAAAGCTCAA
GTTAGAGAACCCTCAGTCTCTTAGTCAATAAGATCAAGAGACTCCCTAAATCGTTATCAC
ATTTTAAAAAGGAGAAATTATGAAAACATCCCTTAAACTTTATTTCACTGCCCTAGTGGC
CAGCTTCTTGCTCCTACTTGG

ORF Predictions:

ORF #	Start	End	Direction	Length
8	1992	2744	F	251 aa

[SEQ ID NO:] 3864226-8 ORF translation from 1992-2744,
direction F

VKLENIDKSIQKQDILQGISLKVSPQKLTAFIGPNGAGKSTLLSIMSRLTKKDQGVLSIK
GREIESWNSQELAQELTILKQKINYQAKLTVEELVSFGRFPYSRGRLRSEDWEKIRETLN
YLELTNLKDRYINSLSGGQLQRVFIAMVLAQDTDFILLDEPLNLDIKQSVSMMQILRRL
VEELGKTIIVLHDINMASQYADEIVAFKDGQVFSKGRTDQIMQADLLSQLYEIPITLAD
INDKKICIYS*

Blastp and/or MPSearch Result:

Description:

ECFHUACD NCBI gi: 4143 - Escherichia coli. (fhuC, ferric
enterobactin transporter ATPase, ABC type)

Assembly ID: 3864242

Assembly Length: 1930bp

[SEQ ID NO:] 3864242 Strep Assembly -- Assembly
id#3864242

CGANGGCCTTGATCTGGTGATGAAAAACAAGAATTGACTGCTGAAACTATCGTCATCAAC
ACTGGTGCTGTTTTCAAACGTCTTGCCAATCCCTGGACTTGCTACAAGCAAAAACGTCTTT
GACTCAACAGGTATCCAAAGCTTGGATAAATTGCCTGAAAAACTTGGAGTCCTTGGTGGC
GGAAATATCGGTCTTGAATTTGCTGGCCTTTACAATAAACTAGGAAGCAAGGTACAGTC
CTAGATGCCTTGGATACATTCCCTACCTCGTGCAGAACCTTCCATCGCAGCTCTTGCTAAA
CAATACCTGGAAGAAGACGGTATTGAATTGCTTCAAAATATCCATACTACTGAAATTAAA
AACGACGGTGACCAAGTGCTTGTCGTAACTGAAGACGAAACTTACCGTTTCGACGCCCTT
CTCTACGCAACTGGACGCAAACCAAATGTAGAACCCTTCAACTTGAAAATACAGATATT
GAATACTGAACGTGGCGCTATTAAAGTAGATAAACACTGTCAAACAAACGTTCTGGT
GTCTTTGCAGTTGGAGATGTCAACGGTGGTCTTCAATTTACTTACATTTCACTTGATGAC
TTCCGTGTTGTTTACAGCTACCTTGCTGGAGATGGCAGCTACACACTTGAGGACCGTCTC
AATGTACCAAATACTATGTTTCATCACACCTGCACCTTTCACAAGTTGGTTTGACTGAAAGC

CAAGCAGCTGATTTGAAACTTCCATACGCAGTGAAAGAAATCCCTGTTGCAGCCATGCCT
 CGTGGTCACGTAAATGGAGACCTTCGCGGAGCTTTCAAAGCTGTTGTTAATACTGAAACA
 AAAGAAATTCTTGGTGCAAGCATCTTCTCAGAAGGTTCTCAAGAAATCATCAACATCATT
 ACTGTTGCTATGGACAACAAGATTCCTTACACTTACTTCACAAAACAAATCTTCACTCAC
 CCAACCTTGGCTGAGAACTTGAATGACTTGTTTTCGATTAAAGTTGAAATCTCATCTTAA
 CTGACAGCCCTCTTTGGGCTGTTTTTACTTCTACGAAACACCAAATCTGTCTTTTCCCTC
 TTTTGTGATATAATAGAAACATGAACCTAAAACTACTTTGGGCCTTCTTGCTGGGCGTT
 TCTTCCCACTTCGTTTTTAAGCCGCTTGGACGTGGAAGTACGCTCCCAGGGAAAGTCGCC
 CTTCAATTTGATAAAGATATTTTACAAAACCTAGCTAAGAAGTACGAGATTGTCGTTGTC
 ACTGGAACAAATGGAAAAACCTGACAACTGCCCTCACTGTCGGCATTTTAAAAGAGGTT
 TATGGTCAAGTTCTAACCAACCCAAGCGGTGCCAACATGATTACAGGGATTGCAACAACC
 TTCCTAACAGCCAAATCTTCTAAAACTGGGAAAAATATTGCCGTCCTCGAAAAATTGACG
 AAGCCAGTCTATCTCGTATCTGTGGACTATATCCAGCCTAGTCTTTTTGTCTATTACTAAT
 ATCTTCCGTGACCAGATGGACCGTTTCGGTGAAATCTATACTACCTATAACATGATATTG
 GATGCCATTTCGAAAGTTCCAAGTCTACTGTTCTCCTTAACGGAGACAGTCCACTTTTC
 TACAAGCCAACTATTCCAAACCTATAGAGTATTTTGGTTTTGACTTGGAAAAAGGACCA
 GCCCAACTGGCTCACTACAATACCGAAGGGATTCTCTGTCCTGACTGCCAAGGCATCCTC
 AAATATGAGCATAATACCTATGCAAACTTGGGTGCCTATATCTGTGAGGGTTGTGGATGT
 AAACGTCTGATCTCGACTATCGTTTGACAAAAGTGGTTGAGTTGACCAACAATCGCTCT
 CGCTTTGTCATAGACGGCCAAGAATACGGTATCCAAATCGGCGGGCTCTATAATATCTAT
 AACGCCCTAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	376	1002	F	209 aa

[SEQ ID NO:] 3864242-6 ORF translation from 376-1002,
 direction F

VLVVTEDETYRFDALLYATGRKPNVEPLQLENTDIELTERGAIKVDKHCQTNVPGVFAVG
 DVNGGLQFTYISLDDFRVVYSYLAGDGSYTLEDRLNVPNTMFITPALSQVGLTESQAADL
 KLPYAVKEIPVAAMPGRHVNGDLRGAFKAVVNTETKEILGASIFSEGSQEIINIITVAMD
 NKIPYTYFTKQIFTHPTLAENLNDLFAI*

Blastp and/or MPSearch Result:

Description:

UNKNOWN DEHYDROGENASE A (EC 1.-.-.-). - ESCHERICHIA COLI.

Assembly ID: 3864254
Assembly Length: 2674bp

[SEQ ID NO:] 3864254 Strep Assembly -- Assembly
id#3864254

CTACTGCTTGTTTGATAAAGTCCTGAATCGGCTCTCCTTGGTGGAGAGCTTTTACTATTT
TCGAACCGGACGATAACACCATCTGACACCGCATTGAAGCGTTCCAGATTGGCTTGACTAG
ATACACCAAAACCTGTCAAGACTGGGATGTGCGCCACTTGATGAAGTTGCGCCAAGTGCT
TGTCCAAATCTGCATCGGTAATTGCCTGATTTCCCTGTTACCCCATTGATGGCAACGGCA
TAGACGAATCCCTCCGCCCTTCAATCAACTCTTTCTGGCGCTCAATTCTGTGGTCAAG
CTTACTAAAGGAATCAAGGCGATATCTGTATCTGCCAAAAATGGTCTACAAAGTTGGCA
TGTTTCATGAGGCAGGCTCTGGGATAATCAAGCCCTTCACAGCTGTATCAGCCAGATCTTTG
ACAAAGTTCTCCACACCGTACTGAAAGAGGGGGTTGAAGTAGGTCATGATGACCAGTGGA
ATCTCTGTTTCAATGGTTTTCAAGTTTTCAACTAAAGCCTGGGTAGAGGTCCCGTGGGCT
AAACTGCGCAAGCCAGCTTCTTCAATAACAGGTCCATCTGCAACAGGGTCTGAAAAGGGA
ATACCCACTTCAATAGCAGAGACACCCAAATCTTCTAAAAAGTGAATTGTTTCAGCAAGA
CCGTCCAAACCTTTTTTCGTGGTCACCAGCCATGATATAAGGAACGAAAATTCCTTTTCCA
GTTGCTTTTATAGCATTCATTTTTCTGTAGTGTCTTAGGCATGAGCTTCTCCCTTCTT
TGCTGCATCTGCTTCCAAGCGGTCTTTGACTTGAACCACATCCTTGTCCCCACGACCTGA
TAGGCAGACAATCATAGACTTTTCTGGTCCAAGTTCTTTGGCCAATTTACCCGCAAAAGC
GATAGCATGGCTAGATTCCAAGCTGGGATAATCCCTTCCACACGAGACAAGAGTTGGAA
TCCTTCCAAGGCTTCTTCGTCTGTACAGGGACATAGCTGGCACGTTTAATATCGTGGTA
GTGAGAATGCTCTGGACCGATACCAGGATAGTCCAAACCTGCTGAGATAGAGAAGGCTTC
AAGAATTTGACCATGGGCATCTTGGAGCACATCCATGAGGGAACCGTGAAGGACACCTGG
ACGACCTTGGTCAAGGTAGCTGCGTGGTGCTCCGTATCCACACCAAGTCCAGCCGCTTC
AGCTCCATACATGGCTACAGACTCATCTTCTACAAAGGGATGGAAGAGCCCAATAGCATTT
AGATCCACCACCAACACAGGCTACTAGGGCATCGGGCAGATTTTGACCTGTCATATCGCG
ATACTGTTGTTTAGCTTCGCGACCGATGACACTTTGGAAGTCACGAACGATTTCTGGAAA
TGGATGAGGCCCCAAGGCAGAACCAAGGATATAGTGGGTATCGTCGATATTAGCCACCCA
TGAACGAAGGGCTGCATTGACCGCATCCTTGAACACGCGCGAACCATCTGTCACTGCCTC
AACCTTAGCTCCCAAAAGCTCCATACGGAACACATTGAGGGCTTGGCGTTTGACATCTTC
CTCACCCATGTAGATGGTACATTCCATGTTAAAGAGGGCCGACAGTTGCAGTTGCCAC
ACCGTGCTGACCAGCACCCGTTTCTGCGATAATTTTCTTTTTTACCCATGCGTTTGGCAAG
CCAAACTTGTCCTAAGGCATTGTTAATCTTGTGGGCTCCTGTATGGTTAAGGTCTTCCCG
TTTGAGATAAATCTTGGCTCCGCCGATATGCTGGGTCAAGTTTTTTGCGTAGTAAAGAGG
AGTTTTACGTCCTACGTACTGGCGCAAGAGTTGGTTTAATTCCTCTTGGAACTTGGGTC
TGCTGACTTTTACGGTAGGCCTTCTCCAACCTCCAAACTGCTGTCAATGTTTCTGG
GACAAAACGTCCGCCGAATTTTCCGTAAATCCATCTTTATTTGGTTTCTGATATGCCAT
GCTTTACCTCTCTATAAATCTTCTAATCTTTTCATGATCTTTTTGTCCATCTGTCTCCA

CTCCGCTCGATACATCTACTGCATAGGGAGTAAAATGTTGAATTGCTTTTACTACATTAT
 CTTTATTAAGGCCACCTGCGATAAAGAAGGGCTGTGCTAGTCCAGTCGTATCCAGTTGAC
 CCCAATCAAAGGACTGGCCACTTCCTGCCACAGGGGCATCAAAGAGTAGATAATCTGCCT
 GAGAATTGGGGACATGCCCATTTCATCTACCTGCACAGCCTGAATACTGGCACAAGGCA
 AATTCTCAAATAAATCATCTGCCACCTGACCGTGAACCTGAACCAAGTCCAAGCCAACCT
 TGTCAATCGCTTCCAGCAGTTCTACCCGACTTGGTGAAACAAATACTCCAACCTTTTTTCA
 CATCTGCAGGAATAAGCTTTGCCAACTCAGCTGCCTCTTCTAAAGTCACCTGTCTTTTAC
 TAGGTGCAAAGACAAAACCGATATAGTCGGCTCCTGCTGAAACGGCTGTTTCCACCGCTT
 CTTTGGTCGATAGTCCACAAATTTTAACCTTTGTCAATCTGCAACTCCTTGATTCTCTGG
 GCCACATTTTCTGCCTGCATAAGAGCTGTCCCTACCAAAATTCCGTTAAAGTATGGGGCT
 AGTCGTTCCGCATCCTGCCCTGTGAAAATGGCAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	117	833	R	239 aa

[SEQ ID NO:] 3864254-6 ORF translation from 117-833,
 direction R

VGTRMWFKSKTAWKQMQRREKLMPKLTLEKLNAIKATGKGIFVPYIMAGDHEKGLDGLA
 ETIHFLEDLGVSAIEVGIPFSDPVADGPVIEEAGLRSLAHGTSTQALVETLKTIEITEIPL
 VIMTYFNPLFQYGVENFVKDLADTAVKGGLIIPDLPEHANFVEPFLADTDIALIPLVSLT
 TGIERQKELIEGAEGFVYAVAINGVTGKSGNYRCRFGQALGATSSSSGRHPSLDRFWCI*

Blastp and/or MPSearch Result:

Description:

TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4.2.1.20). - LACTOCOCCUS
 LACTIS (SUBSP. LAC TIS) (STREPTOCOCCUS LACTIS).

Assembly ID: 3864296

Assembly Length: 3074bp

[SEQ ID NO:] 3864296 Strep Assembly -- Assembly
 id#3864296

CCAACATTCACATGTTCCAATTTTTCTGGTTTGGCTTGTGTAGTTAACAAATACATAA
TCTACACCTGTCAAAACGATGAAGAGGTCTGCATCAACCAATTCTGCCAAACGTTGGGAA
GCGAAGTCTTTATCAATAACCGCTTCGACACCAGTCAAAATGTCCATTGTTTTCTTTGACG
ACGGGAATACCGCCACCACCTGCAGCTACGACGACTTGACCATTATTTAAAAGAGTACGG
ATGGTTTCAATTTCTTTGATATCAACAGGTTTTTGGTGAGGCAACGACCTTACGCCAGCCA
CGGCCAGCATCTTCCTTGAAAGTCGCTCCGCTCTTTTCGGCTTCTGCTTTTGCTTCTTCT
TCTGAATAGAAAGGACCGATTGGTTTACTCAAGTTAACAAAAGCCGGATCATTTTTATCT
ACGACAACCTTGCGTTACAACAGAAGCAACATTTTTTTTCGATGCCTTCATCCAAGAGAGCA
TTTTGCAAAGCATTTTTCAACCAGAAACCGATGCTACCTTCTGTCATAGCGACAAGTGAG
TCGAATGGGAAGGCAGGGTTCCTTTTCAGAGTTCTGATGCCAAATGTTTGGAGCAAGAGA
TTCCCAACTTGAGGTCCCATTACCGTGAGTTGATAATCAAATCATCTCCATTTTTTAATCC
AATTTTACAAGATGCTTAGCTGTTTCAACTAAAGCTTCCTTTGTTGAGCCCTTTGCTGAT
GGGTCAGAAGAAAGAATCGCATTTCTCCCAAAGCTACTACAATTTTACGATTTGCCATA
AATCTCTCTTTATCACACTCAATAGAATGCGTTTAGATTTCAATTTAATGATTTTTTCACA
TATTTTATAAGAAATAATAGATTACCATTATATAAAAGAGGACCGACTAAAGCTATTAG
TCGCAGCCCTCATAGCTGTTGGTAGACGGTTTATTATCTAAAATTATACTTTAGGAATAT
AAAGGTTACCAAGTGTAGCAGCCATAACAGCTTTGATAGTGTGCATACGGTTTTCTGCTT
GATCGAAGTGCGGAGCGTACTTGCTGCGGAAGACTTCGTCTGTTACTTCCATTTCTTCTA
CACCAAATTTTTTCAGCAACGTCTTTACCATAAACAGTGTGAGTATCGTGGAATGCTGGCA
AGCAGTGTAGGAAGATCAAGTTTTTCATTGCCTGCTTTTTTAACTAAGTCCATATTGACTT
GGTAAGGTTTAAAGAAGAGCTACACGTTCTGCGAATTTGTCTTCTTACCCATTGATACCC
AAACGTCGTGTAAAGAACGTCTGCATCTTTAACTGCTTCATCAGCATCTTCAGTGATGA
GAACATGTGCGCCACTTTCTTTAGCAAATCCTTCTGCCAATTC AACGATTTCTTTTTCTG
GGAAGAGTTCTTTTGGTGAGAAGATGTGAACATTGACACCAAGGATAGCACCTGTTACGA
GCAAGCTGTTGGCAACGTTGTTACGTCCATCACCACAGTATACCAATGTCAAGCCTTCCA
AGCGACCGAAGTTTTCTTGAACAGTCAAGTAGTCAGCGAGCATTTGAGTTGGGTGCCATT
CGTCAGTTAGACCGTTCCATACTGGAACGCCTGAGAATTCTGCCAATTCCTTCAACCATAA
CGTTGGCTGAATCCGCGGAATTC AATCCCGTCAAACATACGTCCCAATACTTTAGCAGTA
TCTTCAGTAGATTCTTTTTTACCCA ACTGAATATCATTTGCTCCGAGGTATTCTGGGTGA
GCACCAAGGTCGATAGCCGAGTTGTAAAGGCTGCACGAGTACGAGTAGATGTTTTTTCA
AATAGGAGAGCGATATTCTTGCCAGCAAGGTAGTGGTGTGAATATTGCGTTTTTTTCAA
TCTTTCAAGTGAGCTGAAAGACCAATAAGGTATTCTAACTCTGCACGGGTAAAGTCTTTT
TCTGCTAAGAAGCTGCGTCTTGG AATACTGAATTTGTCAATTTATTATTTCTCTTTCT
ATTTTTTACATTTTCTATTGACGAATGCCGAACAGCGATTACACTTCTTCACGTTC AAT
GGCATAGACATACAACGAGGTCCACCACGGCCCCGAACCAATTC ACTTCCGCGAATCTTA
ATCAAGCGAAGCCCGTATTCTTCCAAAATCTTATTGGTCACGGTATTGCGGTCATAAACA
ACTACCACACCAGGTGCGATGGTCAAAGTGTTAGAACCGTCGTCCCATTGTTTCACGCGCA
GCTGCTACGATATTGCCACCACCGCAACGAATCAAATGAACTTTTTCTACACCAAGGTTT
TGAGCAAGAAGTTCAGCTAAGTCACCTTTCTCTTCAACGATTTTAAGTTTTTCGTTTTCG
TAAGTAACTGAGTAAAACGTGAAGTTCGCTTCGATTTCTGGGTGAATAGTGA ACTTGTC
ATAGTCTACCATAGTGAAGACAGTATCCAAGTGCATGAATTTACGGTTGTTAGCAAATTC
AAAGGCCAAAACTTTCTTGAAGCCAACATTTTTCTTGAAGATGTTGACCAAAAGTTTTTC
GATAGAAGCTGCGTCTGTACGTTGAGAGATACCTACTGCAAGGACGTCTTTAGAAAGAAC

TAGCCTCGTCTCCACCTTCGATACGCGTATCTTCTTCACGGTTGTAGACCAAATCCACTT
 TTCCGCCATAGATTGGGTGGTATTTGAAGATATACCTACCGTAGAGTGTTCACGGTTAC
 GAGTGTCTGCAAACATGTGGTTAAGCGATACGGCGTTTCCAATTGTTGCAAATGGGTCGC
 GAGTGAAATAGAGGTTTGGCATCGGGTCAATTGCAAATGGATAATCTGATTCAACTAAGT
 CAGTTAGATCTTTAGCTTCGTCAGGAATTTCTGGCAATTCACTTTTTGAATCCCAGCCA
 TTGTTTTTTCAACCAATTCTTGGTTGTCCCTTGATGCCGTGAAGCAATTCACGAATAGCAA
 CCTTGGTTTGTACGATCACGGATGTTGGCTTCGTCTAAGTATTCCTCGATAAATTGATCGC
 GGATTTCTGGAGAAGTCCAATGAATCCAGCAGCGAGTTGTTCTACCTCCAGAACCGATTA
 TCTGCTGTTTCGAG

ORF Predictions:

ORF #	Start	End	Direction	Length
7	944	1777	R	278 aa
10	2323	2694	R	124 aa

[SEQ ID NO:] 3864296-7 ORF translation from 944-1777,
 direction R

VQPLQLRLSTLVLTQNTSEQMIFSWVKNNLLKILLKYWDVCLTGLNSADSANVMVEELAE
 FSGVPVWNGLTDEWHPTQMLADYLTQENFGRLEGLTLVYCGDGRNNVANSLLVTGAILG
 VNVHIFSPKELFPEKEIVELAEGFAKESGAHVLITEDADEAVKDADVLYTDVWVSMGEED
 KFAERVALLKPYQVNMDLVKKAGNENLIFLHCLPAFHDHTTVYGKDVAEKFGVEEMEVD
 EVFRSKYARHFDQAENRMHTIKAVMAATLGNLYIPKV*

Blastp and/or MPSearch Result:

Description:

ornithine carbamoyltransferase (arcB) homolog - Haemophilus
 influenzae (strain Rd KW20)

[SEQ ID NO:] 3864296-10 ORF translation from 2323-
 2694, direction R

VKHSTVSISSNTTQSMAEKWIWSTTVKKIRVSKVETRLVLSKDVLA VGISQRTDAASIEK
 LLVNIFKKNVGFKKVLAFEFANNRKFHMLDVTFTMVDYDKFTIHPEIEGDLHVLLSYLRK
 RKT*

Blastp and/or MPSearch Result:

Description:

STREPTOCOCCAL ACID GLYCOPROTEIN. - STREPTOCOCCUS PYOGENES.

Assembly ID: 3864300

Assembly Length: 3205bp

[SEQ ID NO:] 3864300 Strep Assembly -- Assembly
id#3864300

GGGGGCAAAGCCAAAAGACTTCAAATAGCTAGAACCTACTTAAAAAGATGCTGAAATTCT
TATATTTGATGAAGCCACTGCTAATCTTGATGCGGATTCTGAGTATGCGATTATCAGTAG
CCTCTATTCGTATTAAAGGAGAAGACGGTTGTGATTATAGCGCATAGTTTGTCAACGGT
AAAAGATGTGGATTGTATTTTCTTCTTAGAGGAGGGGAAAATCACTGGCTCAGGAACCTCA
TAAGGAACACTGGAATAATCATGAGCGTTATGCTCGTTTTGTGCAGGAGCAAATGATAGA
GTGAAGTGTCTTTTGAGATTACCATTTTATAGTCTATTAAAGGGAGCAGGAAAACTCC
CTTTTATATAGTTTGAAACTATAACTAGCTCTTGAAAAGAAGAAAATGAGTTGATGAAA
ATAAGTGGTACAATAGTTACTATAGATTTGGAGGTATTGTATGAGCAAGGAATTACACAT
TAACACAATTTTGGCCCAGGCGGGTATTAAGTCAGATGAAGCGACAGGTGCATTGGTGAC
ACCGCTTCATTTTCAACGACCTATCAGCATCCAGAGTTTGGTCGATCTACTGGGTTTGA
CTATACGCGCACTAAAAATCCAACTCGTAGTAAGGCTGAGGAAGTCTTGGCGGCTATTGA
GTCAGCAGACTATGCCCTTAGCGACTAGCTCAGGGATGTCAGCTATTGTACTGGCCTTTAG
CGTCTTTCCAGTAGGAAGTAAGGTCTTGGCAGTGCGTGATCTTTACGGTGGTCTTTTTCG
CTGGGTTTAAACCAAGTGGGAGCAGGGAAGTTCGTTTCCATTTTAACTATGCCAATAACA
GAAAGGAAGAGTTGATTGCCGGAGTTAGGAAAAGGATGTGGATGTTCTCTATATCGGAAA
ACCCCAACCAATCCCTTGATGTTGGAATTTGATATCGAAAACTAGCAAAATTGGCTCAT
GCTAAGGGTGGCAAAGTGGTGGTGGACAATACCTTCTATAGCCCTATCTACCAACGTCCG
ATTGAAGATAGAGCAGATATCGTTCTCCATTACAGCAACCAAGTATCTAGCAGGCCACAAT
GATGTCTTGGCTGGAGTGGTTGTGACCAATAGTTTAGAACTATACGAGAAGCTTTTTTAC
AATCTCAATACAACAGGGGCAGTCTTGTCTCCATTTGACAGCTACCAGTTGCTTCGTGGT
CTCAAGACCTTGTCTCTTCGTATGGAGCGTTCAACAGCTAACGCCCAAGAAGTGGTTGCC
TTTTTGAAGGATTCTCCAGCAGTTAAGGAAGTTCTCTACACTGGTCGTGGAGGCATGATT
TCCTTTAAAGTAGCCGATGAAACACGCATTCTCATATTTTGAACAGTCTCAAGGTCTTC
TCTTTTGCAGAAAGTTTGGGCGGAGTGGAAAGTCTTATTACTTATCCAACGACTCAAAC
CATGCTGATATCCAGCAGAAGTACGCCATTCTTATGGTTTGACAGATGACCTCTTGCGT
TTGTCTATTGGGATTGAGGATGCTAGAGATTTGATTGCAGATTTGCGCCAAGCCTTAGAA
GGATAAGACAAAGATGGGAAAATATGATTTTACAAGCCTGCCCAACCGTTTAGGGCACCA
TACCTATAAATGGAAAGAAACAGAAACGGATAGTGAAGTTCTACCAGCTTGGATAGCGGA
TATGGACTTTGTGGTCTTGCCTGAAATCCGCCAAGCCGTGCAAACTTACGCAGACCAACT
GGTTTATGGTTATACCTATGCCAGTGAAGACTTAATTAAGGAAGTTCAAAAGTGGGAAGC

TACACAATACGGTTACAACCTTTGACAAAGAGGCTCTTGTCTTTATCGAGGGTGTGGTACC
 AGCCATCTCAACAGCTATTCAAACCTTTACAAAAGAAGGCGAGGCGGTTTTAATTAACAC
 GCCTGTCTACCCACCCTTTGCTCGCAGTGTCAAGTTGAATAATCGTAGATTGATTACTAA
 TTCTTAGTGGAAGGATGGTCTGTTTGAGATTGACTTTGACCAACTTGAAAAGGATTT
 GGTGGAAGAGGAGGTAAACTCTATATTCTTTGCAACCCTCACAATCCTGGTGGACGTGT
 TTGGGAAAAAGAAGTGTGGAGAAGATTGGCCAACCTCTGCCAAAAACACGGTGTTCGTT
 AGTTTCGGATGAGATTCACCAAGATTTGACCCTCTTTGGTCACAAACACCAGTCTTTCAA
 TACCATCAATCCTGCCTTCAAAAATTTTGCTATCGTCTTGAGCAGTGCCACTAAAACATT
 TAATATTGCTGGAACAAAAAATTCCTATGCAGTCATTGAAAATCCTAAGTTGAGACTAGC
 TTTCCAGAAACGCCTGTTGGCCAATAATCAGCATGAAATTTAGGCTTGGGTTATTTGGC
 GACAGAAGCTGCCTATAGATACGGTAAAGATTGGCTAGAGGAACTCAAGCAAGTCTTTGA
 AGACCACATCAATTCGATGTGGTGGATCTATTTGGAAAAGAGACTAAAATCAAGGTCATG
 AAACCGCAAGGTACCTACTTGATTGGCTTGACTTTTCAGCCTATGACCTGACTGATGAA
 ACATTGCAAGAGTTGTTGAGAAATGAAGCCAAGGTTATCCTCAACCGTGGTTTGGATTTT
 GGAGAGGAAGGAAGTCTCCATTCCCGCATCAAGATTGTTAGCTATGCCCCAAATCTCTGTT
 GCAAGAAGTCTGTGACGCGATTGTGGCTACTTTTGCCAAACGTTAAAAATCCAGCCTTCT
 AGGAGAAAAGTCTTCCTAGAAGGCTATTTTCATAGGCGAAAATATGGTATAATAACAGA
 TAAGGTAAAGGTGAAAATATGGCTAAATTGATTCCGGGGAAAGTTTCGTATCGAAGGTGTT
 GCCCTTTATGAAACTGGTAAGGTTGATATCATCAAGGAAAAGAACAATCGGCTCTACGCT
 CGCGTTGCAAAAGAAGAACTGCGCTATAGTTTAGAGGATGATTTGGTTTTTTGTGCCTGT
 GATTCTTTTCAAAAAGAGGGGCTACTGTGTGCATTTGGCAGCGCTAGAGCATTTTCTGAAA
 AATGATGAGCGTGGTCAGGAAATCTTGTGGAGTCTGGAAGAAGGTCATGAAGAAAAAGAG
 GCCGTTGAAACCAAGGTGACCTTGGGTGGCAAGTTTTTTGAATCGAATTTTATCTCCGAAA
 TCAGAATGCGCCTATGAGTTATCAG

ORF Predictions:

ORF #	Start	End	Direction	Length
9	2479	2823	F	115 aa

[SEQ ID NO:] 3864300-9 ORF translation from 2479-2823,
 direction F
 VVDLFGKETKIKVMKPQGTYLWLDFSAIDLTDLQELLRNEAKVILNRGLDFGEEGSL
 HSRIKIVSYAQISVARSLSADCGYFCQTLKIQPSRRKVFLEGYFHRRKYGIINR*

Blastp and/or MPSearch Result:

Description:

PUTATIVE AMINOTRANSFERASE B (EC 2.6.1.-) (FRAGMENT). -
BACILLUS SUBTILIS.

Assembly ID: 3864312

Assembly Length: 1665bp

[SEQ ID NO:] 3864312 Strep Assembly -- Assembly

id#3864312

AATTGATGGCGCATATAGGCTTCCATGGACCTTGCTTTTTTAGAGTCTTTTGCTGCTTCT
AGCTCCTCAAGTAAATCTGCTAAACTCATCTAAAACTCCTCTTGCCCCACCAAATGGTGC
TGAAAGGCATACACAGTCGCCCTGGGTACGATCGCTGACTTCAAGTTTGGCAAGAATATTG
GACACGTGGGTCTTGACCGTCTTGAGAGAGATAAAGAGGTCATCTGCGATGCGCTGATTT
TCGTAGCCCTTGCGCATGAGTTGGAGAACATCTCGCTCACGCGCAGTCAATTCTTCATGA
AGTTCCATATGATTGCGGTGGTATTCAACCTTCTTGCTAACCTCTTGCTCAATGGCCAGC
TCGCCAGCAGCTACCTTACTGACGGCATGAAGCAATTCATCTGCACTAGAAGTCTTGAGC
ATATAGCCTTTGGCACCAGCATCTAAGACTGGCATGATTTTTTTCATTGTCCAAATAAGAG
GTCACAATCAAAATCTTGGCTTCAGGCCATTCTTTAAGGATTGCTAAGGTCGCGTCAATC
CCATTCATCTCAGGCATGACAATATCCATGACAATGACATCTGGACGCAGTTCCAAGGCC
AAGTCAATCCCTTGAGACCCGTTGGACGCCTCACCCACAACCTTCTACATCGTCTTGAGAG
TCAAAGTAGCTTTTCAAGCCCAATCGGACCATTTCATGGTCATCTACTAGTAAATTTTC
ATCTTTACTCCTTTATCATTCCTTATCTAACAGGGGAATACGGATATCAACTGCCAGCCC
TTGCTTGGGAGCTGTTAATAACTGAACCGTCCCTGCCATATCTTCAACCCGCTCCTTGAT
ATTTTCGAGTCCATAACTCAAGTCGTCTAAGCTCCCTAACCGGAAACCAATCCCATTGTC
CACCACTTCAGTTGCAATTCAACATCTGTCTGATAGAGGTAGACATCTAGGCAAGATGC
CTGGGCATGGCGGAGCGTATTGCTAATCAACTCTTGACAGGATACGGAAGATATGCTCCTC
GATTTTCTTATCGGCAATTTTCGTATATTTCTGCTTGAGACTAACCTAAGATCACTCTTG
TCCTCAAGCTCTTTTAAGAGAATCTGAATCCCTTCTATCAAGCTCTTCTGCTCCAGTTCA
ACTGGTCGCAAATGCAAGAGCAAAACCCGCAAATCCTTCTGGGCAGTTTCTAAATAGCT
GTGACACTCTGCAACTGGATCTGCATCTTTTCTCTATCCAATTTCAAAGCCTGCTGACTG
ATACCCGATAAAATCATGTGGGCCGCAAACAACCTCTGACTGACTGTATCGTGCAAATCC
CGAGCAATTCGCTTCCGTTCTTTCTCGATGATTTCTCTTCTGAGCAAGGCTATGATTT
TCAGCTTTTTGAAGAGCTTCTGTCAAAAGGTTAAGTTTACCTGATAAGGACTTGAAACTG
GCATCCAAATCTGGATCTGCAACCTGAACCATTCTTGCCCTGCCAATAAACGCTTGAGA
TTAGCCTGCATTTTCTTAGAGAAAGCTCTTCGATCCCTCGCCAAAACAGGGCTAAGAGA
CAGGTTATGGACATGCTGAAAACCAACAATAAAAAGACAAATTTTCTGTTTTTTCGACA
TCGTGCAAAAAGATAGACCAGTCAAAATCAAGTATTTCCAGCAAG

ORF Predictions:

ORF #	Start	End	Direction	Length
7	736	906	R	57 aa

[SEQ ID NO:] 3864312-7 ORF translation from 736-906,
direction R
VVDNGIGFRLGSLDDLSYGLRNIKERVEDMAGTVQLLTAPKQGLAVDIRIPLLDKE*

Blastp and/or MPSearch Result:

Description:
unknown

Assembly ID: 3864336
Assembly Length: 2532bp

[SEQ ID NO:] 3864336 Strep Assembly -- Assembly
id#3864336
CTGAGTGAAGAAAAGTACCACCACGAGAAATGATGTCTCCTACTGAAGCTGCATCTAGGG
GATGAATTTACCCGGCAACCATACCAGCATATCCGTCATAGATACCAAACACTTCCATTC
CTTCTGAAATTGCTTGACGAACAACCTGCACGGATAGCAGCGTTCATACCAGGTGCGTCTC
CGCCACTAGTCAAAACAGCAATACGTTTCATATTGGTTTATGCTCCTTTTTCTTTTAACA
TTCTTTCTTGATTATATCACATTTGATTTTAAATTCCTTCTATTTTCCGTATTTTAGCG
ATAAATCGTTTTTCATAACGATTTTCATTCAATTTCTCCTCTAATTCATTGGATTTAGCTAC
AAAATGATGGGGAGAAACGATGGTTTTCTGTTCCTCTTCATACCGGATGATGACTGGGAT
TGGGCCTTTAAATTGTTCTAAAATACGTGAAATTTCTTGATCCGATTCATGATTTTTCAC
CTGTATCCAAAAGCGTTCAGCAACTGCTTCTCTTATTTCTTGCAATCATTTGCAAACG
GCCATCACGTGATTGTATTTTCCCTTTTACATAGTAGAAGGCTCCCTCTTTTATTTCTTG
TCCAACCTGACGATATAAGTCTGAAAAGAGAGTGACATCCAATTTTTTCTTACTATCATC
TGCCTGTAAGAAGGCCATATTTTCACCTTTTTTGGTACGAATCACTTTTATTTTCTGAAC
TTCAACCAAAATAATAGCATAGCTATTTTCTGACAAATTTCCGATTGGGGTAATCGGGTA
AATAGCCTTACTTGCAATAGCTTGTAGNGGATGTATGCTGACACCTATCCCTAAAAGCTC
TTGTTCCATATAAAATTTTCTTGTTCCGTCCAATCTTCCGATTCCTGCCAACTATAAAT
AGCATCTCCAAACAACTTCCCAACTCTTTCACAAATTCAAATAGATTAGCTAAGTTATT
AAATACTTTTTGACGATTTTTTTCAAATGAATCGAAAAGACCAACTTTTACCAAAGGTTT
TAGCAGAGGAAGTTTCAGATAATCTCAGGTAATTTAGCTATAAAATCTTCAATGTTAGA

ATAAGGTCTATGTTCAATAATCCAAAGCGCCAAGTCCTTGCTGAGCCCCCTTAATCGATTT
 CAAACCTATATAGATAGACTTGTGGCAATTTTATCGTGATAGGGAATAGTATTGATGGA
 TAGAGAGGCTACTTCAAAACCTGCTTCAAGTGCATCTATTAAGTAATCACTGTTGGAATA
 ATTTAACATGACCTGATAAAAAATGGCTGGATAATGCGTTTTGAAATAAGCCAACCTGGAA
 GGCCAAGGCTGAGTAGGCGTAGGCATGAGATCTATTAAATCCATAACCTGCAAACCTCTC
 CATAACATCAAAAACCTGCTCTGATTTTTCCGCAGTATGGCCTGCTTCTATGGAGCCTTG
 AATAAAGGAAGCCCTCATCTCATGCATAGCAGAGGCATCCTTTTTACCCATAGCTCGACG
 CAAAATATCGGCCCTTCCCAAGACTAAATCCAGCAAATCGCTGAGCAACCTGCATAACCTG
 CTCCTGATAGAGCATAATGCCATAAGTTGGAGCCAAAATATCCTCCAGAGCTGAATCTAG
 AACAGTCACTTCTTCCTGCCCATGCTTCCTTGCCACAAAATTATTGATGTAGTCACTTGC
 ACCTGGTCGATTTAGAGAAGTAGTTGCTACGACATCTTCAAAACAGACTGGTTGAACACG
 TTTGAGCAAGCGAATGGCACCAGGTGCTCAAATTGAAAGATACCTTTTGTATTTCCAGA
 GGCAAATAAATCTAACGTTTCTTTGTCTTCCAAATCTATTTCTTCAATTTTAAGGTGAAT
 ACCTTCTGTTTTAGCAAGCAACTCTTGCATCTTCTGGACAAAGGTCAAATTTTCGTAGTCC
 CAGAAAGTCCATCTTCAAAAGTCCGCTAGCCTCAACTCCATGAGCATCATACTGAGTCAG
 TGGAATTTTCATCACCATACTTTAGAGGAATGTAGTTGGTTAAATCTTGGTCACTAATTAC
 AACACCAGCCGCATGGACAGAGGTTTGCCTTGATAGCCCTCTATCTTGCAAGCAATCTC
 AAAAGCTTTTTGGTATTCTAACTTACTATTGATTTGGCTGACGAACTGGAGATTGCCCT
 CATAGGCCGACTTAAGATTGTCACGAAACTGATTTTCTTAGTAATTGCAGATAATTCAT
 ACTCTGGCACACCAAAGCGTTTCAAGACATCTCGAAGAGCTTGCTTGGCTCCAAAGGTTG
 AAAAAGTAACGATTTGTGCCGCATGTTTACTACCATATTTATTACCAACATATCTGATAA
 AATCTGGACGATAAATATCTGGGATATCAATATCAATATCAGGCATGGTATAGCGTTTAC
 GATTAAGAAAGCGTTCAAAAATCAGATTTTTCTCTACTGGGTCAATCCCCGTGATGTCTA
 AGGCATAAGAAACCAAACTGCCTACTGCAGAACCCTTCCCATTTCCATATAATAGCCAT
 TCGATCGTCCAA

ORF Predictions:

ORF #	Start	End	Direction	Length
6	295	2232	R	646 aa

[SEQ ID NO:] 3864336-6 ORF translation from 295-2232,
direction R

VCQSMNYLQLLRKSVFVTILSRPMRAISSFVSQINSKLEYQKA FEIACKIEGYPRQTSVH
 AAGVVISDQDLTNYIPLKYGDEIPLTQYDAHGVEASGLLKMDFLGLRNLTFVQKMQELLA
 ETEGIHLKIEEIDLEDKETLDLFASGNTKGIFQFEQPGAIRLLKRVQPVCFEDVVATTSL
 NRPGASDYINN FVARKHGQEEVTVLDSALEDILAPTYGIMLYQE QVMQVAQRFA GFSLGK
 ADILRRAMGKKDASAMHEMRASFIQGSIEAGHTAEKSEQVFDVMEKFAGYGFNRSHAYAY
 SALAFQLAYFKTHYPAIFYQVMLNYSNSDY LIDALEAGFEVASLSINTI PYHDKIANKSI
 YIGLKS IKGLSKDLALWIEHRPYSNIEDFI AKLPENYLKLPLLEPLVKVGLFDSFEKNR

QKVFNNLANLFEPVKELGSLFGDAIYSWQESDWTQEKFYMEQELLGIGVSIHXLQAIA
SKAIYPITPIGNLSESYAIILVEVQKIKVIRTKKGENMAFLQADDSKKKLDVTLFSDLY
RQVGQEIKEGAFYYVKGIQSRDGRQLQMIAQEIREAVAERFWIQVKNHESDQEISRILEQ
FKGPIPVIIIRYEEEQKTIVSPHHFVAKSNELEEKLNIEIVMKTIYR*

Blastp and/or MPSearch Result:

Description:

DNA POLYMERASE III, ALPHA CHAIN (EC 2.7.7.7). - ESCHERICHIA
COLI.

Assembly ID: 3864344

Assembly Length: 2244bp

[SEQ ID NO:] 3864344 Strep Assembly -- Assembly
id#3864344

GTAAACCTAGAGTAATCATTTTTTCAACAGTTTTACGGATTTCTTTAGCACGAGCTTCAG
TTGTCACGATTGATTTCGTTGATCAAAAGGTCAGTTGTCAAATCGCGAAGCATTGCTTTAC
GTTGTGAGCTAGTGCCTAGTTTACGGTAAGCCATGTATTCCTCCTTTATTTATCTTT
TAATCCAAGACCCAAATCAATGAGTTTGAGTTTCACTTCTTCCAAACTCTTGCGTCCAAG
ATTTTCGTACTTTTCATCATCTCTGCTTCAGATTTTTCTGTCAAATCATGCACAGTATTGAT
ACCGGCACGTTTTTAAACAGTTGTATGAACGCACAGACAAGTCCAGTTCCTCAATCGTACG
ATCTAAAATACGGTCGTCAGATTTCAGTATCAGCTTCTTTTCATCACTTCAGTTGACTTAGC
AATCTCAGTAAGATTTGTAAACAAATCAAGATGTTCTGTCAAATACGTGCTGAAAGCCC
TAAAGCATCTTCTGGAATAATTGTTCCATTTGTCAAGATTTCAAGGGTTAATTTGTGCGAA
ACCATCATTTGCTACCTACACGAGCAGGTTCCACTTGATAGTTGACTTTTGTAACGGTGT
ATAAATAGAATCTACAGCAAGTGTTCAACTGGTGCATTATCCTTTTATTTTCATCAGC
AGGTACATATCCACGACCACTGTAAACAGTCATAGTCGCTTTTAGAGAAGAACCCTCACC
AATTGTAAGAGATAATGATCTGGATTTACAATTTCAATATCGCTATCTGTCAAATGTG
ACCAGCTGTTACTTCAGCAGGACCTTCAACATCCAGTTCGATGATTTTTTCGTCTTCAAC
GTACGATTTCACTGCAATTCTTTAATGTTTCAGAATGATTTGCATCACGCTTTCACGAAC
ACCTGGAACGTGTGTCAACTCATGTAACACACCATCAATGTTGATAGATGTCACAGCTGC
TCCTGGTAGAGAAGCTAGAAGTACACGACGAAGAGAGTTACCAAGAGTTGTACCGTAGCC
ACGTTCAAGTGGTTCGATTACAAACTTGCCATAATCTTTATTTTCATCAATTTTTGTTAT
ATTTGGTTTTTTCAAACTCGATCATTTAGTTACTCCCTCTTAAACGAAAAGCAGTGTAATG
CGATGATTATACACGGCGACGTTTTGGAGGACGAGCACCATTGTGTGGCACTGGAGTCAC
ATCACGAATTGCTGTTACTTCAAGACCAGCGGCAGCAAGCGCACGAATAGCTGACTCAG
ACCAGAACCCTGGACCTTTTACAGTAACTTCAACTGATTTAAGACCGTGTCTTGTGCAGA

TTTAGCAGCAGCTTCAGAAGCCATTTGAGCAGCGAATGGTGTACATTTACGAGAACCTTT
 GAAACCAAGAGCACCAGCTGATGACCAAGCAATTGCATTACCATGCACATCAGTAATCAT
 AACAAATAGTGTATTATAAATGTAGCGTGAATATGAGCAATACCAGATTTCGATATTCTTTTT
 CACACGACGTTTACGTGTTGGTTTAGCCAAGACTTTTACCTCCTATATTATTTTTCTTA
 CCAGCAATCGCAACAGCTTTACCTTTACGAGTGCGGGCGTTGTTTTTAGTGTTTTGTCCA
 CGGACAGGAAGTCCACGACGGTGACGGATACCACGGTATGAACCGATTTCCATCAAACGT
 TTGATGTTCAAGTTTACTTCACGACGAAGGTCACCTTCAACTTTGATTGCATCCACTTCA
 CGACGGATAGCATCTTCTTGATCTGATGTAAGATCACGTACACGAACATCTTCTGAGATT
 CCAGCAGCAGCCAAAATTTCTTAGATGTTGCAAGTCCGATACCATAAACATAAGTCAAT
 GAGATTACTACGCGTTTGTCAATTTGGAATATCAACTCCAGCAATACGAGCCATGTTTCCT
 CCTTTCTATCTTATCCTTGACGTTGTTTGTGTTTTGGATTTGCTGGGCAAATTACCATAA
 CACGACCATTACGACGAATAACTTTACAGTATTCGCAAATTGGTTTGACCGATGGTCTTA
 CTTTCATTTCTTATCCCTCCAAGTTTTTCGATTATTTAAAGCGGTAAGTGATACGTCCAC
 GTGTCAAGTCATATGGACTCATTTTCGACAGTAACACGATCTCCCGCTAAAATACGAATAT
 AGTTTTTACGAATTTTACCAGAAACTGTTGCTAAAATCTGATGTTTCATTTTCAAGTTCCA
 CCGTAAACATTGCATTCCGGCATT

ORF Predictions:

ORF #	Start	End	Direction	Length
8	1147	1503	R	119 aa

[SEQ ID NO:] 3864344-8 ORF translation from 1147-1503,
 direction R

VKKNIESGIAHIHATFNNTIVMITDVHGNIAIWSSAGALGFKGSRKCTPFQAQMASEAAA
 KSAQEHGLKSVEVTVKGPGSGRESAIRALAAAGLEVTAIRDVTPVPHNGARPPKRRRV*

Blastp and/or MPSearch Result:

Description:

30S RIBOSOMAL PROTEIN S11 (BS11). - BACILLUS SUBTILIS.

Assembly ID: 3864352

Assembly Length: 2627bp

[SEQ ID NO:] 3864352 Strep Assembly -- Assembly
id#3864352

ATCGAATTATCTTGTATTTTCGTCTGCAAATGGCTAGATGGTAAGAAGTAGACCGACTGAC
TAGCCTATAAACACCCGTTAAATCGCTAAGAAACGTCAAAAAAGCCCTTAACATATGGCAC
TAGTTAGGGGCTTTGGTGTTCATGAACCTTATACACTAACTACATTCTAGCATATAAG
CCCAGATATTTCAAGAGTTTTATTTATTTTTTCAGGTTCCCTTAGTTCTGAAAGGTCTAT
AATGAAGTTAGCCATCTAGTATCAAAAAACCGACTAGCTCTTATGAAC TAGTCGATTTCT
CATCAATGCGCCAACATTTCTTGAGCGATTTCTTGCCAGATAGGTTATCTGGGTAGTAG
GTTGGCCAGTTGTCCATTTCTTCAAAGAGGGCTTCTTGCTTGTGCCTCCAAAGAAGATA
TGGAAATGTTCTGCCTTAAC TGGGGCGATATTGTGGTCACTAACTGAACATACTTGAAT
TGTCCAGCGTCAGCATCTGTGGCTTCAAAGAGGAAACGCACGCCACGATTGCCTTTCTTG
TAAGTCAAAATTTTCTTACCGACATACTTGTAAGTGTATTTCTTGCTTTGTCCACCTTGA
ACAAATTCATAGTATTATCAGTAATGTTAATCTTAGTCACATCTGTCTGATAGCCTTTT
GTATAGTAAGCCTTGTA CTAGCCTGGGTCATCTTACCAGTCAACTTAGCCTTG TAGTCA
AAGACTTGGTCAAACGTGCCGTCCTTCAAGGAAAGGATAAACTGATTGCCAGTTACCTGCA
TAGTCACTCAAGGTGCGGTCCCTTGACAGCTGCATCCTCGAAGTAACCATTTTGGACTGTC
TTGGTATCCTCTGCCTTTTCAGGTTTCGATTGCTGGGCCTTCTTGGTCTGTTGTTTGTTC
AAAGCCTTGAGGTTTTCTCCATCACGGAATGTAGTTTTCTCCAGCCTTGGTGTCTCT
TCTGTACAGACTTTCTAAAGGATTGAGGACATCAGTTTTGACACCTGCTTCTTTTGAAAGT
GTGTTAGCAAGGGCTTGTGAGGCATTTTCTTCAAATAGATATAAGCGATTTTATTTTTC
TTGACATACTCTGTCAATTCTGCCAAGCGAGCAGCTGATGGCTCTGCATCTGGAGAAAGG
CCTGAGATTGCGACTTGTTTGAGTCCATAGTCCAAGGCAAGATAGTTAAAGGCTGCGTGT
TGAGTCACAAAGCTCTTTTGTTTTGCTTGAGACAAGCCTTCTGCGTAAGCCTTATCCAAG
GATTGCAATTTTTCGATATAGGCAGCTGCATTCTTCTCAAAGGTCTCTTTTATCAGGA
TAATCTGCTGACAAGCTGTGCGGATGTGCTCTACTAGTTTAATGGCACGAACTGGTGAT
AACCAAACATGGGGGTCAAAC TCATGGTGATGACCTTCTTCTCCATGGTCATGGTCTCCC
TCTTCTTCTCGCCACCTGGCAAGAGCAACATATCGCCTGTGCGCTTGATGGTTTTCACT
TTTTTCTTATCCAAGGTATCTAGCAATTTAGGTACCCATGTTTCCATGTTTTCATTTTCA
TAAACGAAGGTATCTGCATCTTGGATTTTGGCAACTGCCTTGGCAGATGGTTTCGTATTCA
TGAGGTTCTGTCCCAGCACCGATTAGGAGTTCTACATTAGCCGTATCTCCTGCGACTTGC
TTGGTAAATTCATAGACAGGGTAAAAGGTTGTACGATATTGAGTTTACCATCTGCCTGT
TTTTGATTGGAACAAGCCACTAAAAACAAGGCACATAGACTGGCTAGTAATAAGCTAATT
TTTTTCACGTTTCGTCTCCTATTTGATAAAACGTCTTACTAACTGATTAGTATAAAGACA
GTTACAAAAATAATGGTAATACTTGCAC'TTGCAGGTGTTTCTGCATAGTAGGAAATGTAA
AGTCCTGCTACCATTTCCAAAAAGCCAATCGCACTGGCAAGCAGCATAACCGATTTAAAG
TTTTTCCCCAGACGCAGGGCAATACTAGCTGGCAAGACCATAATGGTCGATACCAGAAGA
GCTCCTGCTGCAGGAATCATAAGGGCAATAGCCACCCCTGTCACCATGTTAAAAAGAATG
GACATGGTACGAACTGGCAAGCCATCCACAAAGGCCGTATCTTCGTCAAAAGTTAAGATA
TACATAGGACGAAGAAAGAGAAAGGTCAAAATCAAAACAACCGCCGAATGACAAAGAGG
GAAATGACCTGTTCTTCACTGATAGTCACGATCGAACC AAAGAGATATTGGTCCAACTC
ATTGAACTCGAGTTTTTACCCTTGCTCATGACAATCAGAGAAACAGCCAGACCTGTTGAC
ACGAGGATAGCTGTCCCGATTTCCATAAAGCTCTTGTAACCGTACGGAGATACTCCAGA
AAGACCGCCGCAATCAAGACAATGGCAATAGTAGAAATAGTTGGAGAAATCCCCAAAACC

AGACCNAAGGATACACCTGAAAATGAGACGTGGCTAAGGGTATCANTCATCAAACCTCTGA
 CGACGCACAGATGAGGAAGGTTCCCAATACCGNTGAGTAAAGACTCATAGCAATAACCGC
 CAAAAGGCGCGTTGTATAAAGTCGTAAGATNATAAACTAAGCATGG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	303	1808	R	502 aa
7	1818	2528	R	237 aa

[SEQ ID NO:] 3864352-6 ORF translation from 303-1808,
 direction R

VKKISLLLASLCALFLVACSNQKQADGKLNIVTTFYPVYEFTKQVAGDTANVELLIGAGT
 EPHEYEPSAKAVAKIQDADTFVYENENMETWVPKLLDTLDKKKVKTIKATGDMLLLPGGE
 EEEGDHHDGEEGHHHEFDPHVWLSPVRAIKLVEHIRDSLSADYPDKKETFEKNAAAYIEK
 LQSLDKAYAEGLSQAKQKSFVTQHAAFNYLALDYGLKQVAISGLSPDAEPSAARLAELTE
 YVKKNKIAYIYFEENASQALANTLSKEAGVKTDVLNPLESLTEEDTKAGENYISVMEKNL
 KALKQTTDQEGPAIEPEKAEDTKTVQNGYFEDA AVKDRTLSDYAGNWQSVYPFLEDGTFD
 QVFDYKAKLTGKMTQAEYKAYYTKGYQTDVTKINITDNTMEFVQGGQSKKYTYKYVGKKI
 LTYKKGNGRNVRLFEATDADAGQFKYVQFS DHNIAPVKA EHFHIFFGGTSQEALFEEMDN
 WPTYYPDNLSGQEIAQEMLAH*

Blastp and/or MPSearch Result:

Description:

ADHESIN B PRECURSOR (SALIVA-BINDING PROTEIN). -
 STREPTOCOCCUS SANGUIS.

[SEQ ID NO:] 3864352-7 ORF translation from 1818-2528,
 direction R

VRRQSLMXDTLSHVSFSGVSXGLVLGISPTISTIAIVLIAAVFLEYLRTVYKSFMEIGTA
 ILVSTGLAVSLIVMSKGKNSSSMSLDQYLFSGSIVTISEEQVISL FVIAAVVLILTF LFLR
 PMYILTFDEDTAFVDGLPVRTMSILFNMVTGVAIALMIPAAGALLVSTIMVLPASIALRL
 GKNFKSVMLLASAIGFLGMVAGLYISYYAETPASASITII FVTVFILISLVRRFIK*

Blastp and/or MPSearch Result:

Description:
unknown

Assembly ID: 3864366
Assembly Length: 1841bp

[SEQ ID NO:] 3864366 Strep Assembly -- Assembly

id#3864366

ATCGAATTCGAAC TAAGATAAAGGGGACATTGAAAGCATCAACTTGC ACTATGGGGACCC
TTTTATCTTTATGGAGGAGTTTATCAGGATACAAAAGAAATGGTCAAGATAACTTCTGG
TACCTTATTTGACCATTTGGCAGGTTGAAGTGTCAGTTGACTTTGCACGTATCCAGTATCT
CTTTGAGCTCAGAGATACAGAAGGTCAAAATATTTTGTATGGCGATAAAGGGTGTGTGGA
AAATTCTCTAGAAAATCTTCATGCAATCGGGAATGGATTTAAGTTGCCTTATCTTCATGA
GATTGATGCCTGCAAGGTTCCCTGACTGGGTTTCAAATACGGTATGGTATCAGATATTTCC
TGAAAGGTTTGCCAATGGCAATGCTCTATTAAACCCAGAAGGGACTTTAGACTGGGATTC
ATCTGTCACACCTAAGAGCGATGATTTCTTTGGTGGTGATTTACAGGGGATTATTGATCA
TATGGATTACTTGCAAGACTTGGGTATTACTGGACTATATCTTTGTCCCATCTTTGAATC
TACAAGCAATCACAAGTACAATACGACAGATTACTTTGAAATTGACCGTCATTTTGGAGA
CAAGGAGACCTTTTCGGGAAC TGGTGGATCAAGCGCATCATCGTGGCATGAAAGTCATGCT
GGATGCGGTATTTAATCATATTGGTTTCGCAATCTCTTCAATGGAAAAATGTCGTCAAAAA
TGGTGAACAGTCTGCTTATAAGGATTGGTTCCATATTCAACAATTCCCAGTGACAACCTGA
AAAGCTAGTTAATAAGAGAGACTTACCCTATCATGTTTTTGGTTTTCGAGGACTATATGCC
TAAGCTAAATACAGCCAATCCAGAGGTCAAGAATTATCTTTTAAAGGTTGCGACTTATTG
GGATTGAAGAGTTTAATATCGATGCTTGGCGTTTGGATGTGGCTAATGAGATTGACCATC
AGTTCTGGAAGGATTTTCGTAAGGCAGTTT TAGCTAAAAATCCTGATCTTTATATCCTAG
GAGAAGTCTGGCATACATCTCAGCCTTGGCTAAATGGAGATGAGTTCCATGCCGTCATGA
ATTATCCTTTATCTGATAGTATCAAGGACTATTTCTTACGAGGAATTAAGAAGACAGACC
AGTTCATCGATGAAATCAATGGAGAGTTTATGTATTACAAGCAGCAGATTT CAGAGGTCA
TGTTTAATCTCTTGGATTACATGATACAGAGCGAATCCTGTGGACGGCCAATGAAGATG
TTCAACTGGTTAAATCAGCCTTAGCCTTTCTCTTTTACAAAAGGAACACCGTGCATTT
ATTACGGAACCGAGCTAGCCTTGACTGGAGGACCAGATCCAGATTGTCGTCGTTGTATGC
CTTGGGAACGTGTATCAAGTGACAATGATATGCTGAAC TTTATGAAGAGGCTGATTAAAA
TTCGGAATACGCGTCAGTAATCATTTTCGCATGGCAAGTATAGCCTTCAAGAAATCAAAT
CTGATCTAGTAGCTCTGGAATGGAAATACGAAGGACGGATCCTCAAAGCAATATTCAACC
AATCAACAGAAGATTATCTTTTAGAGAAAGAAGCAGTAGCAC TAGCAAGCAATTGCCAAG
AATTGGAGAATCAGCTTGTCTATCTCTCCAGATGGATTTGTGATTTTCTAAAACTAGTTG
ATGAAGATTATGGTACATTT CATATCTTATATAGTATAATAAGGCTAGTTACTAAACTTG
TAAAGGAGAACTTAAATGAATTGTAGAGGACATGAAACAAGACAAAGAATTGTTAGAGAT
TTTGAAGTTTAGCCTAAAGCACATATTAAGCTGTTAGCAAA

ORF #	Start	End	Direction	Length
7	939	1670	F	244 aa

101

CTCATTTCATGAGGAGCTCATCAATCTGCAAACGACCCGCAGTATCAATCAAGACATAGTC
 GTTATGATTAGTTTGGGCTTGCTCCAAACCTTGACGTACAATCTCAACAGCTGGTACTTC
 TGTTCGAAGTGCAAAGACAGGCACATCAATCTGTTGTCCCAAGGTCTTAAGCTGGTCAAT
 GGCAGCTGGACGATAAATATCCGCCGCAATCATCAAAGGACGAGCATTCTTCTTTCTTCTT
 GAGTTTGTGGCCAATTTACCAGCAAAGGTTGTTTTACCAGCCCCTTGTAACCAACCAT
 CATGATGATGGTTGGAATCTTAGGTGACTTGATAATTCGATCTGCCGTATCAGAACCTAA
 AACGGCTGTCTAGTTCCTCATCAACGATTTTAATAATCTGTTGCGCAGGATTAAGTGATC
 AATGACCTCATGCCCCGACTGCACGCTCACGAACCTTCTTGATAAAGTCCTTTACAACAGG
 CAAGGCAACGTCGGCCTCGAGCAAGGCCAAGCGAATTTCTTTGGTTGCCTCTTGGACATC
 AGATTCAGAGATTTTTCCTTTTTTACGTAGATTTTAAAGACGTTCTGCAAACGTTCTGT
 TAAACTTTCAAATGCCATTTTCTTCTCTTATTCTCTATTATCAATGCTTGTTAAATTT
 TCTATCTGCTCCTGCAGAAAATCATCCTTGGGATAGCGATCCAAGATTTGGTCAAAAATC
 TGACTACGGACAATGTAGTCCGAGTACATGTGCAATTTTCATCTCATAATCTTCCAGAATC
 TTTTCTGTTGCTTGATATTGTTCATAGACAGCCTGACGACTAACACCAAACCTCCTCAGCT
 ATCTCAGCAAGACTGTAATCATCAGCGTAGTAAAGCTCTATATAATTCATTTGCTTATCT
 GTCAAAGCGCCCCGCATAAAATTCAAAGAGCGGCCCATTCATACGATTGGTTTTTTTCGA
 TTTCCATAACTTTTATTATACCAAAAAATAGCCTAATCTACCACACTAGGGAGCCAATCC
 TTGAAGATAGAAAGTAGATTTGAGAAAAACGAGATCCTAGCCCCAAGTAATTTCCAATTG
 ATAGCTGGCAAAGGGATGCCCCCTTTGATTTTGTAGTTGATAAGCTAGCTCAATCTTTTG
 CCTATCAACTTGATAACGGCTCGTTTGAATGATAAATTCCTGCATGCCCATAGGGGTAGG
 AATATAGGCCAACTATCACTATCCTTTAAAAAGCGCATAATGGTCTTGGGATTAGAAAA
 TCGGCTCATCACCAGTTCTTGACCATGAAATTTAATAACTACTTTTTCCTTTTCCTCATT
 ATGAAAGAGTAAATAGCTATAATCTCCCTTTTCATGCACTTCCACA

ORF Predictions:

ORF #	Start	End	Direction	Length
8	1717	2025	R	103 aa

[SEQ ID NO:] 3864384-8 ORF translation from 1717-2025,
 direction R
 VEVHEKGDYSYLLFHNEEKEKVVIFKHGQELVMSRFSNPKTIMRFLKDSDSLAIPTPMG
 MQEFIIQTSRYQVDRQKIELAYQLQNQEGHPFASYQLEITWG*

Blastp and/or MPSearch Result:

Description:
 unknown

Assembly ID: 3864400
Assembly Length: 1561bp

[SEQ ID NO:] 3864400 Strep Assembly -- Assembly
id#3864400

CTTGATTATGGCTGTTTTGGAAAAACGGGCAGGGCTTCTCTTGCAAAATCAGGATGCCTA
TCTCAAATCTGCTGGTGGTGTAAATTGGATGAACCTGCCATTGACTTGGCTGTTGCAGT
TGCTATTGCTTCGAGCTACAAAGACAAGCCAATAATCCTCAGGAATGTTTTGTCGGAGA
ACTGGGCTTGACAGGAGAGATTTCGGCGCGTGAATCGTATTGAGCAACGCATCAACGAAGC
TGCTAAACTGGGCTTTACTAAGATTTAAGTACCTAAGAATTCCTTGACAGGAATCACTCT
GCCTAAGGAAATTCAGGTCATTGGCGTGACAACGATTACAGGAAGTTTTGAAAAAGGTCTT
TGCATAATCCGTGACAAATTCCTCTTAAAAATGATAAGATAGGAGAAAATATTTGACTATCA
AATTTTCAAGGAGGGAATCGTGTCTGATTTTTGAACAGTTTATGCAAGCTAATCAGGCTTA
TGTTGCCCTACATGGGCAGTTAAATCTGCCACTTAAACCCAAAACAAGAGTAGCTATTGT
GACCTGTATGGAATCTCGTCTGCACGTTGCGCAAGCTCTGGGCTTGGCACTTGGGGATGC
TCATATCTTGCGGAATGCAGGTGGTTCGAGTGACTGAAGACATGATTCGTTTCGCTAGTTAT
TTCCCAGCAACAAATGGGGACAAGAGAGATTGTGGTATTGCACCATACAGACTGTGGTGC
TCAGACCTTTGAAAAATGAACCTTTTTCAGGAGTATTTAAAAGAGGAATTAGGTGTAGATGT
GTCAGACCAGGACTTCTTGCCCTTCCAAGATATAGAAGAGAGTGTACGCGAGGATATGCA
ACTGCTTATCGAGTCTCCCTTAATACCAGACGATGTCATTATCTCTGGTGCTATTTACAA
TGTTGATACAGGAAGTATGACAGTCGTAGAATTATAAATACTTCATTTAGAAAGAAAGTG
TATGAAGAAAAGCAGTATTTTATTGCTATGTATTGGTTTACAGTATGAAACCATCTACTA
TACGGACGGTCCAAGGTCAGGTGCGGAATATGGACTAATGGGAGTTTCTATCTTTCTAGC
TCTCTTTTACATGATTCCGGCTCTTTATTTTCTCTTCCATATTGGGAAAAAATGGGAATT
GCCAAAGAAGGTTTTGATTCTGTCTTTATTGGGAGCAATCTGTTCTTTACTTCTCTCTT
ACTATTTGGAATCTATAATCACAGACGAAAGTCATCTAAGGTATAAAAAATCGACCAGTT
ACTGGGGGTTCTTTTCCCAGATAGTACATTTTTTAAATGCCTTTGAAAGTGCTATTGTGGC
TCCTTTGGTAGAAGAACCCTTGAAATTCGATTGCCACTTGTTTTTGTGGCTTTGATT
CCTGTGCGAAAATTTAAATCTTTGTTTTTACTTGGGAATTGCTTCCGGTTTGGGATTCCAA
ATGATTGAGGATATTGGTTATATTTCGTACGGATTTGCCAGAGGGCTTTGACTTTACTATT
TCGCGAATTTTAGAGCGTATCATCTCAGGAATGCCTCTCACTGGACTTTTTTCAGGTCTA
G

ORF Predictions:

ORF #	Start	End	Direction	Length
7	371	937	F	189 aa

[SEQ ID NO:] 3864400-7 ORF translation from 371-937,
direction F
VTNSLKNDKIGEIFYQIFKEGIVSYFEQFMQANQAYVALHGQLNLPLKPKTRVAIVTCM
DSRLHVAQALGLALGDAHILRNAGGRVTEDMIRSLVISQQQMGTREIVVLHHTDCGAQTF
ENEPFQEYLKEELGVDVSDQDFLPPFDIEESVREDMQLLIESPLIPDDVIISGAIYNVDT
GSMTVVEL*

Blastp and/or MPSearch Result:

Description:
unknown

Assembly ID: 3864416
Assembly Length: 2009bp

[SEQ ID NO:] 3864416 Strep Assembly -- Assembly
id#3864416
AATGATTTTCAAGCAGACGATCCATGTCATTTCAAGGAATACATGCGACGATTTCCCTTC
GTTTCGATCGGGCTTGATCAACTCTTGATCTTCATAATAACGAATCTGACGCGCCGATAG
ATCGGTCAACTTCATAACACTGCCGATAGGAAAAACAGCCATATTTCCGGCGAAATTCCTT
TTCCTTCATTTACAATTTCTTCTTTCTGTCTATTATAGTCTAAAAAAGACAAACGTCA
ATTGATAATGTTATAAAATGTAACATTATTTTTCTTTATTCTCTAAAAAGAGACGAATAC
GATCAATATCGTAATTTACGATAATTGCGACAAAAACTCCCATAAACGTTTCTAAAACAC
GCACAAACACGTACAAAATTGTCTCACCCTTGGAATTGATAGGGTAATGATTAACATAG
CTGCTACACCACCAATAACCCCTGCTTTGTTATTCATGGCTACATTTGTCATAATGGTTA
ACATGGTGCAGATTGGAACAACTACCAAGGTCACCCAAAAGGCTTCGTGGAAAAAGGTAT
TTAATAAGAAGAAGACCAAGGCATAGAGTCCACCGATACTATTTCCTAGAATACGCGAAG
TCCCAAAATGAACACTCTCATCAAACTCTCCCTCAGGCTAAAAACGGCTGTCAAAGCAC
CAATTTGAAGACCTTTCCAGCCAAAAAAGCCAAAAATCAAGAGAACTAGAAAAACAGCAA
TACCTGTTTTTAAAGGTTTCGCATACCAAGTTTGAAGTGGGATTTATCGAATTTATATTTTT
TAAATAAATCATAATCTCAACTTTCTATTTCCATTTTATCATAAATCGGTGATTTTTAT
GAGTAATAGTTGAGAGGAAGCGTTTTTATTTTAAAGCAAAAAGAAAAGAGGAACTTTCATCC
CTCTCTTCTTTGATTTATTTATAAAATCTTATTTTTCTGTCAAGGCTGCAAGTCTGGAA
GAACCTTACCTTCAAGAAGTTCCATTGATGCTCCACCACCCGTAATAATCCATGAGAACT
TGTCTGCACGGCCAAGGTTAATCGCTGCGGCAGCTGAGTCACCACCACCGATGATTGATT
TAACTCCTGGTTGTTTCACGATAGCGTCCATCACACCGATTGTACCAGCTCTGGAAATCT

GGGTTTTCAAATACACCCATAGGTCCGTTCCATACAACCTGTTTTAGCACCAGTCAAAGCT
 TCGTCAAATTTGGCGATAGATTTTGGACCGATGTCAAGACCAAGGAAGCCTTCAGAACT
 GCTTCACCTTCAGTGTCAACGCACCTTCAGTGTAAACCAGCAAATGCGTTAGCTTCTTTTGA
 GTCAACTGGCAAGATCAATTTACCATTTGCTTTTTTCAAGAAGAGCTTTCGCAACATCCAG
 TTTGTCTTCTTCTACAAGTGAGTTACCGATTTTCGATACCTTGTGCTTTGTAGAATGTGTA
 AGTCATCCCACCACCGATAAGGACTTTATCAGCTTTTTTCAAGCAAGTTTTTCGATAACACC
 GATCTTGTCTGAAACTTTTGAACCACCAAGGATAGCCACAAATGGACGTTCTGGAGTTTC
 AACTGCTTCTTGGATGTAGGCAATTTTCGTTTTTCAAGAAGGAAACCAGCAACTGCTTTTTTC
 AACGTTTGTCTGAGATACCAACGTTAGATGCGTGTGCACGGTGAGCTGTACCGAATGCATC
 GTTTACGAAGATACCATCTCCAAGTGATGCCAGTATTTACCAAGTTCAGGATCGTTTTTT
 AGATTCTTTCTTGCCGTCAACATCTTCGTAACGAGTGTTTTTCAACCAAGAGAACTTGTC
 ATCTTCAAGAGCGTTGATTGCCGCTTCCAATTCAGCACCACGAGTGACACCTGGGAAAAC
 AACATCTTGACCAAGTTTGTCTGCCAAGTCAGCTGCTACAGGAGCAAGTGATTTACCAGC
 TTTATCAGCTTCTTCTTTCACACGTCCAAGGTGAGAGAAAAGAATTCGATGTCCACCTTG
 TTCGATGATGTACTTAATAGTTGGAAGAG

ORF Predictions:

ORF #	Start	End	Direction	Length
7	929	1189	R	87 aa

[SEQ ID NO:] 3864416-7 ORF translation from 929-1189,
 direction R
 VLKQLYGTDLWVYLKTQISRAGTIGVMDAIVKQPGVKSIIGGGDSAAAAINLGRADKFSW
 ISTGGGASMELLEKVLPLAALTEK*

Blastp and/or MPSearch Result:

Description:

PHOSPHOGLYCERATE KINASE (EC 2.7.2.3). - YARROWIA LIPOLYTICA
 (CANDIDA LIPOLYTICA).

Assembly ID: 3864424

Assembly Length: 2299bp

[SEQ ID NO:] 3864424 Strep Assembly -- Assembly
id#3864424

TGTGAAAGAGTCCATGGTTCCGATGGCAGCGTTGGGTAGGTCTGCCAACTGGCGACCCAA
GTGTTGTTTGAGCTCGACATCATCTGTTTTCTTGGATTTTCTTGCTGATTTTTTCTCTA
AACGTTCTTTAAGTTCAGTTGCAGCCTTGACGGTAAAGGTTGAGATAAAGAGTTGAGAAA
TTTCGACACCACGCGCCAATTGGTCCAGAATGCGCTCTGCCATGACAAAGGCTTTTCCAG
AACCAGCCGATGCTGAGACCAGGATATTCTGGCCAGAAGTGATAGATAGCTTCGATTGCT
CGGCAGTTTTCTTCTGTTCTTGTCTCGAATTTGCTTCTGCTTCTTGCAGTTTTTGAATCT
CCTCCTCACTTAAAAAGGGAATAAGCTTCATCGATTCAACTCCTCTCTAATTTTTTCAAC
CCAAGCTTGCTTGAGTTTTTCTCCGACCAGACGCTTGCTATCAGCTAGGTCCAACTTTTT
TAGGAAACGGGCTTGGCCCAGATGGTAATTGGCTTCAAAGCCTGTAATAGCCTGATGTTG
CTGGACGTATGGGGCAATGCTTCTGCCATTTTCAGTATAAGGATTGATGGCGAACCGGCC
TGCTAAAATCTTCTCAGCAGCTTCTTGTAAGATAGGCATTGTAGTCCAGTAGGAGCTG
AAATTCCTCATCTGTCAGTTGATTAGCCTTGTTTTTGTATATAAAATTCGCCTAAATAACT
GCTTCTTTTTTCCAAGAAGAGCCCTTGGTATTTTCATAGATTGCTGGCTTCTACCACTGC
TCCTGCAAGACTTTTTACCGCCATCAGAGATTGGACAGGTTTCAGCCATTTCCAAGTACAT
GGCGCCGAAAAAGTTCTGCTCCCTTCTCTTTTTTAGGGCAGCAAGATAGGTTGGTAAC TG
AGAATTGAGCCCATTAAGAAATGAGGAACTGGAAGTGAAGTCAAGTGGATTTGTAGTC
TACTACTCCTATCGCTCCATTAGCTTTCAAACGGTCAATCCGGTCCACCTTGCCCTCGTAC
AAAGACACTGCGTCCATTGTCCTAATTGAATAAAGGCTTGGTCTTTTCCACCAAATTTGC
TTCTTCTTTGATGGTTTCGATGGCTGGATTGTGTGCGGAGAATATGTCCAGTCGTCCTGTC
AACATCAAGCAAACTTCCTTGGTAAACTGGGCTTCCAAACTTTCTTGATAAATAGCTTC
AAATTCGCGTTCTTGACTGGTTTCTTGAATAGCTTGTTCTAGACGTTGGTCAAAGGAATC
TTCATTAGGCAACTGTAAGGCGCGTTCAAAGATACGATGCAAGAAATTCCTCGTGACTACG
GGCATCAGGATGCAAACGAATTCCTCCTGCAAGCCTAAAACGTAGCGTAGGAAATAACTG
TATTCATTGCGATAAACTCTGTCAAACCCGACGTAGACAGGTAAAACTCCTGTTTGGCA
GGATAGAGAGCTTGCAAGGTGTCCTTGGCTAAGGTCTTGCTGCTTGGACTGATTGGGATG
GCTGGATTTTCCAGACCTTGCTGATCTAGTTTTTTACCTATGACACGCGACAGAACCCTTG
ACAAAAGTCAAATCTTGCTCAGTATCGCTCATCTCACCTGCTGGTGATAGGCAACCAGA
CTAGACAAAAGACTGTGATAGGACCCCATATCCTCCTTAGACAGTCCTTTGTGATTCATC
CTCTTCTCTCTCCGCCTAAATCCAAAATGGATCAACTCTTGAAGATAGGCAGATTCCTTA
CTTTCATTTTCGTTAAAAAGGCTTGGAGCCGACAAGAACAAGTCTTACGAGCAGAATTG
ACCAAGGAAAGCATAGTGTAGCGATTTTTCTTGAGATTTTCACTGCTGGCAATCAGTAAT
TGAACGCCTTCTTCGGTCGCTTGGTTTAGGTTTTGCCTTTCTTCATCTGTCTAGAAGACTG
GTGTTTTGAGAAATTTTGGTAAATTCGATCCTGAGTTAGTCCAATAGCATAGACAAAGT
CAGCAGTCAATGGTGCAATCAAATCGTAACCTGCAACCAGAACAGTGTCCACTGTTGCTG
GAATGGTACGGTATTGGGACAACTCATTCCAGAATGGAGCAAGGCTAGGAAGTCTTCCA
GACTAACCTGTGAACCAGCAAAAACAGTCGCAATTTGTTCTAAAACATGGCAGAAAGCCT
TCCAAACTTCGGCTTGCTTTTCTTCTACAGCTTCCAAAGTGGTTGTCAAATCTTGTA
ACTGCTTGGTCACAGCTCCTTCTTTTAGAAAGACACTCCATTTTTGTAGGAGTTTTTCAA
CCTTTTGTTCCTCGCTGGC

ORF Predictions:

ORF #	Start	End	Direction	Length
7	388	1008	R	207 aa

[SEQ ID NO:] 3864424-7 ORF translation from 388-1008,
direction R
VDRIDRLKANGAIGVVDYKSSLTQFQFPHFNGLNSQLPTYLAALKREGEQNFFGAMYLE
MAEPVQSLMAVKSLAGAVVEASKSMKYQGLFLEKESYLGEFYNKNKANQLTDEEFQLLL
DYNAYLYKKAEEKILAGRFAINPYTENGRSIAPYVQQHQAITGFEANYHLGQARFLKKLD
LADSKRLVGEKQAWVEKIREELNR*

Blastp and/or MPSearch Result:

Description:
unknown

Assembly ID: 3864430
Assembly Length: 1915bp

[SEQ ID NO:] 3864430 Strep Assembly -- Assembly
id#3864430
AGAGGTAGGTTCGTAAACGTAAAAAATCTAATTGAAATGAAAGGGCTAGAGGAAATCTAG
TCCTTTTCTTTTAAATAAACTCCAAAGCCTGCAAAATCTGAAACTTCCTCCTACAA
TTTGATATAATAGAGAGAAGAATTCATTTGAAGGAGGAAATGATGTCGGTTTTAGTAAAA
GAAGTGATTGAAAAGCTTAGACTAGATATTGCTCTATGGTGAACCAGAATTGCTTGAAAAG
GAAATCAATACAGCGGATATTACGCGACCTGGTCTTGAAATGACAGGCTATTTTGACTAC
TATACACCAGAGCGGATTCAACTTTTGGGGATGAAGGAGTGGTCTTATCTGATCAGCATG
CCTTCCAACAGCCGTTATGAAGTTTTGAAAAAATGTTTCTACCTGAGACACCAGCAGTC
ATTGTTGCCCCGTGGTTTGGTGGTTCCAGAGGAGATGTTAAAGGCTGCTAGAGAATGTAAG
ATTGCTATTTTAACCAGCCGTGCAGCTACCAGTCGTTTATCTGGAGAGTTATCTAGCTAT
CTGGATTCTCGTTTGGCAGAACGTACCAGTGTGCACGGTGTCTTGATGGATATTTATGGG
ATGGGCGTCTTGATTTCAAGGAGATAGTGGGAATTGGTAAGAGCGAGACAGGTCTTGAGC
TTGTCAAACGTGGTCACCGTTTGGTAGCCGATGACCGTGTGATATCTTTGCCAAGGATG
AGATTACTCTCTGGGGTGAACCAGCTGAAATTTTGAAACACTTGATTGAAATTCGTGGGG
TTGGTATTATCGATGTTATGAGTCTCTACGGTGCAGTGCTGTCAAGGATTCTTCACAGG

TTCAGCTTGCTGTCTATTTGGAAAATTACGATACGCATAAGACCTTTGATCGTCTTGGA
 ACAATGCAGAGGAACCTGAAGTTTCTGGCGTAGCCATTCTCGTATTCGTATTCAGTTA
 AAACAGGTCGTAATATCTCTGTTGTGATTGAGGCAGCTGCCATGAATTATCGTGCCAAGG
 AAATGGGCTTTGATGCTACCCGTTTGTTCGACGAACGACTGACAAGTCTCATAGCTCGAA
 ATGAGGTGCAAAATGCTTGATCCAATTGCTATTCAACTAGGACCCCTAGCCATTCTGTTGG
 TATGCCTTATGTATTGTGACAGGCTTGATTCTTGCGGTTTATTTGACCATGAAAGAAGCA
 CCTAGAAAGAAGATCATACCAGACGATATTTTAGATTTTATCTTAGTAGCCTTTCCCTTG
 GCTATTTTAGGAGCTCGTCTCTACTATGTTATTTTCCGATTTGATTACTATAGTCAGAAT
 TTAGGAGAGATTTTGGCCATTTGGAATGGTGGTTTGGCCATTTACGGTGGTTTGATAACT
 GGGGCTCTTGCTGCTCTATATCTTTGCTGACCGTAAACTCATCAATACTTGGGATTTTCTA
 GATATTGCGGCGCCTAGCGTTATGATTGCTCAAAGTTTGGGGCGTTGGGGTAATTTCTTT
 AACCAAGAAGCTTATGGTGCAACAGTGGATAATCTGGATTATCTACCTGGCTTTATCCGT
 GACCAGATGTATATTGAGGGGAGCTACCGTCAACCGACTTTCCTTTATGAGTCTCTATGG
 AATCTGCTTGGCTTTGCCTTGATTCTGATTTTGTAGACGGAATGGAAGAGTCTCAGACGA
 GGTATATCACGGCCTTTTACTTGATTGGTATGGTTTCGGTCGTATGGTCATCGAAGGT
 ATGCGAACAGATAGTCTCATGTTCTTCGGCCTTCGAGTGTCCCAATGGCTGTGAGTTGTC
 TTTATCGGTCTCGGTATAATGATCGTTATTTATCAAATCGAAAGAAGGCCCTTACTAT
 ATTACAGAGGAGGAAACTAAATGTTAGAAGTGCATATATTCTTGTTGCCCTAG

ORF Predictions:

ORF #	Start	End	Direction	Length
7	627	1100	F	158 aa

[SEQ ID NO:] 3864430-7 ORF translation from 627-1100,
 direction F
 VGIGKSETGLELVKRGHRLVADDRVDIFAKDEITLWGEPAEILKHLIEIRGVGIIDVMSL
 YGASAVKDSQVQLAVYLENYDTHKTFDRLGNNAEELEVSGVAIPRIRIPVKTGGRNISVV
 IEAAAMNYRAKEMGFDATRLFDERLTSLIARNEVQNA*

Blastp and/or MPSearch Result:

Description:
 unknown

Assembly ID: 3864442

Assembly Length: 2245bp

[SEQ ID NO:] 3864442 Strep Assembly -- Assembly
id#3864442

ATCGAATTTGAAGTGGTTTGAAGAGAGTACAACCTTGTCTTTTAGAAAAGGAGCCTATAAT
GAAAGTCTTTTCAGCATGTAAATATCGTGACTTGTGATCAAGATTTCCATGTTTATCTTGA
TGGAATCTTAGCAGTCAAGGATTCTCAAATCGTCTATGTCGGTCAAGATAAGCCANCGTT
TTTAGAACAAAGCTGAGCAGATTATAGACTATCAGGGAGCTTGATTATGCCTGGTTTGGT
CAATTGTCACACCCATTCTGCAATGACAGGTCTGAGAGGGATCCGAGATGACAGCAATCT
CCATGAATGGCTCAATGACTATATCTGGCCAGCAGAATCTGAGTTTACTCCCGACATGAC
TACCAATGCGGTCAAAGAAGCCCTAACAGAGATGCTCCAGTCAGGAACAACAACCTTTAA
CGATATGTATAATCCCAATGGTGTGGATATCCAGCAAATTTATCAGGTGGTGAAAACCTC
CAAGATGCGTTGTTATTTTCTCCGACTCTCTTTTCTTCAGAGACAGAAACAACCTGCTGA
GACTATAAGCAGAACTCGATCCATCATAGACGAAATCTTAAATATATAAAATCCAAATTT
CAAGGTTATGGTAGCACCTCATTCTCCGTATAGCTGCAGTAGAGACTTGCTGGAAGCGAG
TTTGGAATGGCAAAGAGCTAAATATTCGCTCCATGTCCATGTGGCGGAGACCAAGGA
AGAGTCAGGAATTATCCTCAAACGGTACGGCAAACGCCCCCTTGCTTTTCTGGAAGAACT
GGGTTATTTAAGATCATCCGTCCGTATTTGCTTCACGGGGTCAATTAAACGAGAGAGAA
ATTGAACTTCTTGGCATCTTTCTCAAGTGGCTATCGCCACAATCCTATCAGTAACCTCA
AACTGGCATCAGGAATTGCTCCAATTATCCAGCTCCAAAAAGCGGGAGTAGTAGTCGGAA
TTGCGACTGACTCGGTTGCTTCCAATAACAATCTAGATATGTTTGAGGAAGGAAGGACTG
CAGCTCTTCTCAGAAGATGAAAAGTGGGGATGCCAGCCAGTTTCCAATCGAAACAGCTC
TCAAGGTACTGACAATCGAAGGGGCTAAGGTCCTTGAATGGAAAATCAGATAGGAAGTC
TGGAAGTCGGCAAGCAAGCAGATTTTCTGGTCATTCAACCACAAGGGAAAATTCATCTCC
AACCTCAGGAAAATATGCTGTCTCACCTGGTTTATGCACTTAAATCTAGTGATGTAGATG
ATGTTTATATCGCCGGAGAACAGGTGTTAAGCAAGGTCAAGTCCTGACAGTAGAACTTT
AAAAGAAAAATCACGAAAAATTTTAAAAAAGTCTGCAACAAATCTTGCAATCTTTTTTT
TGACTATGCTATACTTATATACGGTTTAAAAAACTGCCTAAGACAGTAGGGGAGCTCGA
CTCATAAATATCCTACCGAGGACAAAACGTATCATGTAAAAAGAAGCGTATTGTACTTTC
GTGTCTAGGTTTGGGCGCGTTTTTCTTTTTGAAAAATTCCCCAAGCAAAATAATTACGGA
GGTGAAACACACTAATGAGTGAAGCAATTATTGCTAAAAAAGCGGAACTAGTTGACGTAGT
AGCTGAAAAAATGAAAGCTGCTGCATCTATCGTCGTTGTAGACGCTCGTGTTTGACAGT
TGAGCAAGATACAGTTCTTCGTCGTGAGCTTCGTGGAAGCGAAGTTGAGTATAAAGTTAT
TAAAAACTCAATCTTGCGTCGTGCAGCTGAAAAAGCTGGTCTTGAAGATCTTGCACTGTG
ATTTGTTGGACCATCTGCAGTAGCATTCTTAATGAAGATGTTATCGCACCAGCGAAAAT
CTTGAAACGACTTTTCTAAAAACGCTGAAGCACTTGAAATTAAAGGTGGTGCAATCGAAGG
CGCTGTGCGCATCTAAAGAAGAGATTCTTGCACTTGCAACTCTTCCAAACCGCGAAGGACT
TCTTTCTATGCTCCTTTCTGTACTTCAAGCGCCAGTGCGCAACGTTGCTCTTGCACTCAA
AGCGGTTGCAGAAAGCAAAGAAGACGCGGCTTAATCTTAAGCTACACAGCGTAGCCTAGC
TACGAAAAAACTATTATAAAATTTAAAACCTATTTGGAGGAAATAACAATGGCATTGAA
CATTGAAAACATTATTGCTGAAATTAAAGAAGCTTCAATCCTTGAATTGAACGACCTTGT
AAAAGCTATCGAAGAAGAATTTCGAT

ORF Predictions:

ORF #	Start	End	Direction	Length
7	867	1322	F	152 aa
8	1562	2074	F	171 aa

[SEQ ID NO:] 3864442-7 ORF translation from 867-1322,
direction F
VAIAHNPISNLKSLASGIAPIIQLQKAGVVVGIIATDSVASNNNLDMFEEGRTAALLQKMKS
GDASQFPIETALKVLTIEGAKVLGMENQIGSLEVKGQADFLVIQPGKIHLPQENMLSH
LVYALKSSDVDDVYIAGEQVVKQGQVLTVEL*

Blastp and/or MPSearch Result:

Description:

N-ethylammelane chlorohydrolase [Rhodococcus corallinus]

[SEQ ID NO:] 3864442-8 ORF translation from 1562-2074,
direction F
VNTLMSEAIIAKKAELVDVVAEKMKAAASIVVVDARGLTVEQDTVLRRELRGSEVEYKVI
KNSILRRAAEKAGLEDLASVFGPSAVAFSNEDVIAPAKILNDFSNAEAEIKGGAIEG
AVASKEEILALATLPNREGLLSMLLSVLQAPVRNVALAVKAVAESKEDAA*

Blastp and/or MPSearch Result:

Description:

50S RIBOSOMAL PROTEIN L10 (BL5). - BACILLUS SUBTILIS.
(BLAST)

Assembly ID: 3864450
Assembly Length: 1471bp

[SEQ ID NO:] 3864450 Strep Assembly -- Assembly
id#3864450

GGGAGAGAACTGTGACAGAAAAACCAACAAATACTCGTTCTCTAACTGCAGAAGATTG
TGAAGATTTCCAAAGGGGAATTGCATTTAGAAAATGATTTGATTGATGAATCTTCTATG
GTGAAAAAGCTCTTGATTTGGAAGGGGATGATTACCAGGATGGCATCAAAAACAAAGATG
GTAAGGATTATCTAGGATATAACAGTCATCCCTTGCTAGCAGACAGTGATGGGGATGGTT
TGGCAGATGGGGAAGATGATAATAAGAAAGAATGGTATGTCACAGACCGTGATTCTCTTC
TCTTTATGGAGTTAGCTTATCGAGACGATGATTATATTGAGAAAATTTTAGATCATAAGA
ATCTTTTCCCTAGTCTCTATCTTGACCGTCAAGAACACAACTCATGCACAATGAATTGG
CTCCTTTCTGGAAGATGAAAAAGCCTACTATACAGATAGTGGCTTGGATGCTTCTTAT
TTGAGACCAAGAGCGACCTTCCTTATCTCAAAGATGGAACGGTGCACATGTTGGCTATTC
GTGGAACGCGAGTTAATGACGCCAAGGACTTGAGTGCAGATTTTGTTTTATTAGGTGGAA
ATAAACTAGCTCAAGCGGATGATATCCGCAAGGTTGTTGGGGAATTAGCCAAGGATATAA
GTATTACTAAGTTGTATATGACAGGTCATTCTCTTGGAGGCTACCTAGCTCAGATTGCAG
CGGTTGAAGATTACCAAAAATATCCTGATTTTTATAACCATGTATTGAGGAAAGTGACAA
CTTTCAGTGCTCCTAAAGTCATTACTTCCAGAACTGTTTGGGATGCTAAGAATGGTTTCT
GAGATGTTGGTTTGGAAAGTCGTAAATTAGCTGTTAGTGGAAAAATTAAGCATTATGTGG
TTGATAATGACAATGTTGTGACTCCCTTGATTCTATAATAATCGTGATATTGTTACATTTA
CAGGTAATTCACGCTTTAAACACCGTTCTCGTGGCTATTTTGAAAGTCCAATGAATGATA
TTCCTAACTTTAATATTGGTAAACAAGCTACCTTGGATAAACATGGTTATCGTGATCCGA
AATTGGATAAAGTGCGATTCTTTAAGAAACAGGCTCTACCTCAATCTTCTAGTCAACCAA
GCGCTGAACCAATGGAAAAATATTGCCTTAGGAAAACAGGTTACTCAAAGTTCGACAGCTT
TCGGAGGAGATGCTAGAAGAGCTGTGGATGGCAAAGTCGATGGTAACCTATGGTCACAATT
CTGTCACTCATACAAACCTCCAATCTAAGCCTTGGTGGCAAGTAGATTTGGCTAAAGAAG
AAACCATTTCGCCAAATCAATATTTACAACCGAACAGACACTGCCCAGGATAGATTGGCAA
ACTTTGATGTCATTCTTTTAGACAGTTCTGGTAAAGAAATTTCGAGTGAAAACGTATAATA
TCTCCTAAAGATGTGTCAGCACAAATTCGAT

ORF Predictions:

ORF #	Start	End	Direction	Length
7	897	1448	F	184 aa

[SEQ ID NO:] 3864450-7 ORF translation from 897-1448,
direction F

VVDNDNVVTPLIHNNRDIVFTGNSRFXHRSRGYFESPMNDIPNFNIGKQATLDKHGYRD
PKLKDVRFFKKQALPQSSSQPSAEPMENIALGKQVTSSTAFGGDARRAVDGKVDGNYGH
NSVTHTNFQSKPWWQVDLAKEETIRQINIYNRTDTAQDRLANFDVILLDSSGKEIRVKTY
NIS*

Blastp and/or MPSearch Result:

Description:
unknown

Assembly ID: 3864482
Assembly Length: 1954bp

[SEQ ID NO:] 3864482 Strep Assembly -- Assembly
id#3864482
CTACGATAAAGTCACCAGAGTCATTAGCAGGTGCTTGAACAAGTTCCTCAGTTTTTTCTG
AAGCTTGGTCAAAAAGTTCGATAACTTGGTCTGCAGATGTTGCTTGACGAAGTTGTCTG
CAAAACCGTCTTTCATCAAGTATTGAGACAATTCTGTCAATGCTGCCAAGTGAGTATCAT
TGGCACCTTCTGGAGCTGCAATCATGAAGAAGAGGTCAGTTGCCTGCCCATCCAAACTCT
CATAGTCAACACCCTTGTTTGACTTAGCAAAGAGAACTGTCGCTTCTTTGACAGCAGCGT
TTTTTGCTGTGAGGCATAGCGATTCCATCACCCAAACCAGTAGAAGTTAAAGCTTCACGCG
CCAAAATGCCTTCTTTAAAGGTTTCAAAATCTGTACATAACCGTGGCCTGTTAGGCTTT
TAATCATCTCTTCAATGACAGCAGTCTTTTTCAGTTGCCTGCAAATCCAGCAACATGACAT
CTTTTCTCAATAAAATCTTGAATTTTTCATCGTTTTTCTACCTCAACTTTTCCATATGTTTC
TTTAATAAATTCGCCCGTTGCCAAGTCATCTGAGAAGGTAGTTGCCGTTCCGCAAGCCAC
TCCCCATTTGAAGGCTTCTACTGCGTCTTTTGATTTGACAAATTCACCTGTGAATCCAGC
AACCATAGAATCACCAGCTCCAACTGAATTTTGTGACTGTTTCCTTTGATTGGTTTAGCGAA
GTAAGCTCCCTCAGATGTGACAAGAAGGGCACCATCACCAGCCATAGAGATAATAACATT
TTGAGCACCCCTTAGCCAGTAACTCACGAGCGTATTTCTCAATTTTCATCTAAACTTTTCGAG
TTTAACCCCCAAAAATCGCTCCAAGTTCATGATTATTTGGTTTTACAAGAAGAGGCTGGTA
ATCCAAACTATCAATTAAGGTCTGTCCTTCAAAGTCACAGACCACTTGCGCACCAGTCTG
GCGCGTCAAGGAAATCAAATCCTTATAGATAACATTGCCTAGATTTTTCAGCACTTGAACC
TGCAAAGACAACCTGTATCTTCTGCTGTCAGACTAGATAAAATAGCTTTCAATTCTTCTAG
CTTAACCGGTTCAACAGTTGGACCCGTTCCGTTGATTTCTGTTTCTTGGTCTGCTTNGAT
TTTAACATTGATACGAGTATCTTCTGCCACCTGGACAAAAGGGTCTCGATTTCTTCCCTC
TGGCTAAAGTATCTGTGATAAAATTTACCAGTAAAGCCACCGATAAAATCCCGTTTCGCTGTA
TTTGATATATTCAAACGTTTCAAGACACGGCTGACATTGATTCCTTTCCCACCAGCAAAC
TTATCATCACTGTCCATACGATTTACACTACCAACTTTGACTTGGTCCAAACGAACGATA
TAGTCAATGGATGGATTGAGTGTGACTGTATAAATCATACTTCTATTACCTCCGTTTCT
CCTTAATAACCTGCAAGAGCTCATGCCCTTGACTAGTGATAACGATAGCGCGTTTGAGTG
GGGCTACCTTGGCAAAGCAAGTTTGTCCAATTTTGTGACGAATCCACCAAGACGTAGGTCT
GCTTGGCATTCTCCAAAATAGCTCTTTTCACAGCTCCCTCCTCCATATCAGGAGTCGTAT
AATAGCCATCGTCAACACCATTTCATTCGATAAAAGGCACGGTCAAAGTGCAATTGGTTAA

TCTGGTTAAGAGCAACGCCCCGATACTAGCATCTGTCGCCGCTTGACGTTTCCTCCAA
 CCATGACAGTTGGAATCTGCTTTTCAACCAACTGAGCGGCATGGTGAATGGAGTTGGTCA
 CAACTGTAACATTCTTATTGACCAATTCATGAATCAAAAAAGCAGTTGTTGTTCCCAGCA
 TCCGATAAAGATGACATCTTTTCTTTAATGAGAGAGGCTGCTTCTGAGCCAGCAATT
 TCTTTTCTTGAAGGTTTTTGACAGATTTTCTTG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	505	1170	R	222 aa

[SEQ ID NO:] 3864482-6 ORF translation from 505-1170,
 direction R
 VAEDTRINVKIXADQETEINGTGPTVEPVKLEELKAILSSLTAEDTVVFAGSSAKNLGNV
 IYKDLISLTRQTGAQVVCDFFEGQTLIDSLDYQPLLVKPNHELGAIFGVKLESLDEIEKY
 ARELLAKGAQNVIISMAGDGALLVTSEGAYFAKPIKGTVKNSVGAGDSMVAGFTGEFVKS
 KDAVEAFKMGVACGTATTFSDDLATAEFIKETYGKVEVEKR*

Blastp and/or MPSearch Result:

Description:

1-PHOSPHOFRUCTOKINASE (EC 2.7.1.56) (FRUCTOSE 1-PHOSPHATE
 KINASE). - RHODOBACTE R CAPSULATUS (RHODOPSEUDOMONAS
 CAPSULATA).

Assembly ID: 3864496

Assembly Length: 1975bp

[SEQ ID NO:] 3864496 Strep Assembly -- Assembly
 id#3864496

TCAAAGAGTAACAAAGGCACCAAATTCTCGATAGGAACGATTTAGCACGGTAAACTTCAT
 CCACTTGGGTTACGGAACCAAACCAGCAATAATTTCTTTGGGCACGGGTAAATAGCATT
 TTGGTCAACTAGGAGTAGATAGAACACATTTCTTCTTCGTCTATATCAATCTTAACACC
 TGTTTCAGCGATAATCTTGTGCGATGGTTTCTCCACCCTTACCGATGACAATCTTAATCTT
 GTCCACATCAATCTTGATCGTATCAATTTTCGGAGCAGTTGGAGCCAATTCTGGACGAAC

TTCTGGAATGGTTGCTTCAATGACATCAAGGATTTCAAACGCGCTTCTTGGCTTGAGC
 AAGAGCCTCCGTCAAGATTTCTGCAGTAATCCCTTGAATCTTGATATCCATTTGAAGGGC
 TGTAATCCCATCACGAGTACCTGCAACCTTGAAGTCCATATCTCCAAAGTGATCTTCCAA
 ACCTTGGATATCTGTCAATACTGTGTAGTTATTTCCATCTGAGATAAGTCCCATAGCAAT
 ACCAGCTACTGGCGCCTTGATTGGCACACCACCAGCCATAAGGGCAAGAGTTCCCGCACA
 GATAGAAGCTTGAGATGAAGAACCGTTTGATTCCAAAACCTTCTGCTACTAGACGGATAGC
 GTATGGGAATTCTTCCAAGCTTGGCAAGACTTGAGCAAGAGCACGCTCACCAAGGGCACC
 GTGACCGATTTACGACGACCTGGCGCACCGTAACGACCTGTTTCCCTACAGAATATTG
 AGGGAAGTTATAGTGGTGCATAAAGCGTTTCTTGTACTCTGGATCCAAACCATCAATGAT
 TTGAGTTTCTCCCATCGGAGCCAAGGTCAAGACTGAAAGAGCTTGAGTTTGCCACGAGT
 AAAGAGACCTGAACCATGTACACGAGGAAGGAAGTCAACAACCGCATCCAAAGGACGGAT
 TTCATCGACCTTACGACCATCAGGACGCACCTTGTCTTCTGTAATTAAACGTCGCACTTC
 TGGCGTGTCCATTTGTTCCAAGATTTTCAGCCACATCAGCATAATACGGTCAAATTCTTC
 GTGGTCCGCATATTTTCTTCTGTAACGGCAGTCACTTGGTCTTTCACTGCTTGAGTTGC
 AGCTTCACGGGCCAATTCTCTTATACTTGAAGTGCCTTTTGGAGGTCACTGTTGTAGGC
 TGCAATGATTTTCAGCTTGCAATTCAGCATCCACGTGAAGCAATTCCACTTCTGCTTTTTC
 TTTACCGACAGCAGCAACGATTTCTTCTTGAAGGCAATCAATTCTTTGACAGCTTCGTG
 CCCTTTAAGAAGCGCTTCCAACATGATTTCTTCTGACAATTCTTTGGCACCAGACTCTAC
 CATGTTGATAGCGTGCTTGGTTCAGCTACTGTCAATTCAAGAAGAGATTGCTCTGCTTG
 TTCTTGACTTGGGTTGATGATGATTTGGCCATCTACATATCCCACTTGTACCCAGCAAT
 TGGTCCGTCAAATGGAATATCTGAAATAGACAGTGCCAAAGATGAACCAAACATAGCAGC
 CATTGGTGCAGATGCATTTTCATCATAAGAAAGCACTGTATTGATGACTTGGACTTCATT
 ACGGAAACCTTCCGCAAACATAGGACGAATCGGACGGTCAATCAAACGCGCTGTCAAGGT
 CGCATCTGTTGAAGGACGTCTTTCAGTTCATAAAGCCACCAGGAACTTCCCAGCCGC
 ATACATTTTTTCTTCTGAGTTGACTTGGAGTGGGAAGAAATCCCCAGTTGCCATTTTCTT
 AGACATAACGGCAGCAGTCAAGACAGTTGACTCACCGTAACGTACGACAACAGATCCATT
 TGCTTGCTTAGCAACCTGACCAGTCTCTACAATTCGATCACGACCCGCAAAAGTCGTTTG
 AAACACTTGTTTTGCCATTTTAATCCCCTTTGGATTGATGAAATTATACGCCCTTG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	1	1128	R	376 aa

[SEQ ID NO:] 3864496-6 ORF translation from 1-1128,
direction R

VKDQVTAVYEEKYADHEEFDRIMRDVAEILEQMEHAEVRRRLITEDKVRPDGRKVD EIRPL
 DAVVDLPRVHGSGLFTRGQTQALSVLTLAPMGETQIIDGLDPEYKKRFMHYHNPQYSV
 GETGRYGAPGRREIGHGALGERALAQVLPSLEEFYAIRLVAEVLESNGSSSQASICAGT
 LALMAGGVPIKAPVAGIAMGLISDGNNYTVLTDIQGLEDFGDMDFKVAGTRDGITALQM

DIKIQGITAIEILTEALAQAKKARFEILDVIEATIEVRPELAPTAPKIDTIKIDVDKIKI
VIGKGGETIDKIIAETGVKIDIDEEXNVFYLLLDQNAINPCPKLLLLVWFREP KWMKFT
VLNRSYREFGAFVTL*

Blastp and/or MPSearch Result:

Description:

polynucleotide phosphorylase (pnp) homolog - Haemophilus
influenzae (strain Rd KW20)

Assembly ID: 3864514

Assembly Length: 1678bp

[SEQ ID NO:] 3864514 Strep Assembly -- Assembly
id#3864514

CTCATGTTTGTATTTTTTAAACCAAGAAAACTGCTAATAGTAAGTAAGGATAAAAAGAAA
TAGTATGCTATATAAGAGAAAAAAATCCTATAAAGAACTAGCATTGTTTGCAATACTT
ATACCATAAAATTCTCTTAAAAATCAACCTCCTTTATCTCCAAAGAGAAGCTAAAACCA
TACTAAATGCAATCAGAAAAATCAATAAAAAATAAAGTCGCCGTCCAAATCCCCGTACTA
AGAGCTGCTAATTTGAACTAAACTGGTAAAGTGCTTAATTGATTTTCAGACGAATACGA
CACTCCAACCTATTAAAAATAGTTATTCATCAAATAAAAAAGAATAATATATATGTGAAC
GGAAAGCAATATACTCCAGTCGTCATATCTTGAAGTAAACTAAGATCCATTCTAATACA
TTTGGATGGATTGAATATTGGCGACAGCGCAATAAATATACTGTACTAGATAAAACACAG
GATAGCAGTAATATAAAATAAACCAATACTGATAAAAAATCTTTTTTGTAATTTGAACA
AATTGTTTTCATTATACATAGTCCTCTGAATGTAGAAAAATGTACCATAAACAACCAAAC
AACTAACAAATAAAATAAAAGCAAGATGCCCCACTAAC TAAGGAAAGACTGATATCTTTCT
GATATCCCAAAGCTAATGTTGTCAAGGTTCTAAGTAAGATAGCCCTAAAATAGCCCAA
AAATACCACCAACCATCATATAGGCAACTGGGATGAAAATAGCTCCTATTTTTTTCTTCA
CTAGCAAAGCACTAGCTAGTCCAAAAATAGAGAACACAGCGCCCCAACTCCATACCAGA
GAGTCGTACAAGACTATAGAGCAACTGATTAGAATCAAATAATTCTTTTAAGGCACCAC
TATAATCTCCAATATAAATTTCTGATAAGGAGTCACTAAAAGATTAATTCCTAATAATA
ATAAATAGGGGAGAAAAAAGACTAGAAAAGAAGAAATAATTGCAGTACTACCTACAATAG
CCAGATACTTCTTTTGTAGAAATTCGGGCACAAATTGTGCTGTTAGAAAATGACTCTCAGCAT
CCTCTATTATCTGACTAGAATAGGGCAGTGACAGATAAGTGCAGCTACTAGGCTAATCG
GTGAAAATCCTCGAATAGAAGAAGCGGCAAAAAAATCGATAAACCTTCAATTTTATAAA
TACCATTGAAAGCAAGGAAATTTCTAAACTCATGCAAAGAAGGGTCAAAAATAAAGACA
TATAAATCGAGGTGATTGAACGACTCCGTACAAGATTACAAATGAAAAATTCCATCCTT
ACTCCTCCTTATAATAAAAAATAGGGTGTAGCATTTCTTTTTCATGCTACACCCACAATCA

ACCATCTTTAAGGCTTACTCTGACAAGTAAGTTAATAAGAATCTGGACTCCAAGAACCTG
 AAGTATGAATTCTTACATGATTTCCAAATTGTGGCGCCATAGCTAATCTAGTACCAGAAC
 CAATATAATTGTCACCACCTCCATTATAGTACATGACAATCCTAGAGCCAGACCCCAATG
 AATATACCGGGTAATATCTGACCCACTATAGGCGCTACGAATAGAGGTACTTAACCTTT
 TACCGCCACCAGTGCTGCTCACTGTTATTAATTCCAGCAGAGGCGTTTTCTTTCTCAAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	551	937	R	129 aa

[SEQ ID NO:] 3864514-6 ORF translation from 551-937,
 direction R
 VTPYQEIYIGDYSGALKELFDSNQLLYSLVTTLWYGVWGAVFSIFGLASALLVKKKIGAI
 FIPVAYMMVGIFWAILGLSYLEPVTTLALGYQKDISLSLVSGHLAFILFVSCLVVYGT
 FLHSEDYV*

Blastp and/or MPSearch Result:

Description:
 unknown

Assembly ID: 3864518
 Assembly Length: 2908bp

[SEQ ID NO:] 3864518 Strep Assembly -- Assembly
 id#3864518
 CTGGTGAAGTTGACTGAGACCGAAGCGATAGGCATCCATGATAATCAAGACAGTCGCACT
 GGGAACGTTGACCCCAACCTCAATAACCGTCGTCGAAACCAGAATATCCGTCTTTCTCTC
 CTTGAAATCCTGCATGATCTGGTCTTTTTCGTCACTCTTCATCCTACCATGTAAAAGAGC
 CACCTCTGTCTCGCCTGCAAAATGAGTCGTCAACTCCTCTGATAAGGCAATGGCATTTTT
 CAAATCTAGAGCTTCTGATTCTTCAATCAAAGGAGAGATGACATAGACTTGGGAACCTTT
 TTGAATTTCCCCCTCTAACCAAGTCAAGACCTGAGGTAGTTGCTCATGTTTGATCCAGCG
 CGTCACAATAGGCTTCCGACCTGCTGGCATCTGGTCGATAATGGAAACATCCATATCTCC
 AAAGGCTGTGATGGCAAGCGTCCGTGGAATGGGAGTCGCCGTCATCATGAGGACATCTGG

ATTGTGCGCTTTTTCCCGTAAAATACGCCTTTGCCCTACACCAAACGGTGCTGCTCATC
GATAATAATCAAACCAAGACGAGCATACTCCACCCCATCTTGTATCAGAGCGTGAGTTCC
TATAATCAAATCAGCCTCACCCCTGGCAATGGTCTCCAAGACTTCTCTCTTTTCTGCAGC
TTTCAAGGAACCTGTCAAGAGAGCCAGTTTCAAATTGGGAAAAAGGTTCTGTAAACTCTC
AAAGTGTGCTCTGCGAGGATTTCTGTTGGTACCATTAGGGCAGCCTGATAACCTGCTGT
CACTGCCGCAAACATGGCCAAGCCAGCGACTACCGTTTTTCCGCTCCCCACATCTCCTTG
TAGGAGACGATTATGTGGTGGTGGACTTCATATCAGTTAAAATTTCTTGCAAACCTTT
TTCTTGAGCTTGGGTGAGGGCAAAGGAAGACTTGCTTTAACTGCTGTCACTTTTTCTTG
AGACCAATCCAGAACCAGACCACTTCCCTGAACTCTATTTTCAGACTTGAGCGTCTGCAG
CTGCATTTGGAAATAAAAGAGTTTCTCAAACCTTGATACGGCGAAGAGCCTGCTTGTATT
TGCCAAATCCTTTGGAAAATGCATAGCTCGGACTGCCTGACAACGGGACATGAGTTTGTA
TTTGTCTAGTAAAGACTGGGGCAGATTTTCTTCTATCAAGAGGTCCAGTCCCTGATCAAA
AGCCGCTTTGATGACCTTGACCAGACTGGCCTGACTGATTCCCTGAGCCAGACGATAGAC
AGGCTGGAGGTCATCTTCTACCTGAGCCAGAACCTTCATCCCAGTCAGACTAGCCTTAGC
GCGGTCCCATTTTCCAAAGACAGCAAGGGTTGCTCCCAACTCTATTTTATCAGCCAGATA
GGGCTGGTTAAAGAAATTCACCGCAAAAACGACCTCTCCCTGCTTGAGACTAAAACGCAG
GCGATTGCGCTTGAAACCATAATACTGGACACTAGCAGGAGTCACTACCTGACCAGAAAG
AACTGCCTTCTCACCGTCTTCTAGTTCCAGCACCTGCTTGGTTTGAAGTCTTCATAACG
GAAAGGAAAGTAGAGCAAGAGATCTTGCAAGTTTTCATTCCTAGTTTGCGGTATTTTTTC
TGCTGACTTTGGTCCCACACCAGGCAAGACATGCAAGGGTTGATGTAGATTATGCTCCA
CTCCTTTCTTTTCTAATAATATTCTCTCGGAATACGGTCGCTGAGGAGGCAAACCACCTC
ATAGTTAATGGTTACGCGGTAGGTCGCTACCTGAGTTGCAGTGATTTCCTTATCCCCATT
GGAGCCAATCAAGGTTACCTTGGTTTCTAGCGGATAAAGCTTAGGCAATCGAATAGTGAT
TTGGTCCATCGAAACCCTGCCGACAATTGGGCAAGCTTGGCCATCTACCAAGACAGAGAA
ATTTTGATGTCTCTTGTCCATCCATCTGCATACCCGATTGGCACGGTCGCGATGACTTG
CTCGCTATCCGCTTGATAAGTTGCTCCATAGCCCATGCAAGCTCCAGCTGGAACGTCTT
GACATGAAACCAGAGCAGACTCCAAGGTCAAGGCCGGTATCAAATCATAAGGCAAATTCA
AGACCGCTCCACTTGGATTGAGGCCATACATGGCATCTCCCATACGAACCGCATTGAAAA
TAGTCTCTACATGCCAAAAGTCGTTGCAGAATTGCTAGCATGAACCAGCTCTGGAACCT
CCTTCATACTAGCTAAAATAGTATTAAACCGTTCTAACTGGGCATTAAAATAGTCATCTG
ATTCTCATCAGCAGTAGCAAAGTGGGTAAAGATTCTTCAACACGAACACCGTGTTGTT
GGGAGCAAATCTTGAGCCTGCTCAACCTCACTGGCCTCTCTAAAACCAATCCGTCCCATC
CCTGAATCAATCTTGAGGTGGACTGTCAATCCAGTTAGGTCCACTTCCTTATCTAAGAGT
GCTTGGAATCCACTCCAGTCCAGCCACTGTCAAGGTGAAGTCATATTCTTTAGCTAGAAG
CAACAGCTTGTCTGAGTTCAATGGCTTCATCAAACCTCTAAAATGAGGATTGGCTTGCTG
AGTCCAGCTTGTCTGAGTTCAATGGCTTCATCGATATTGGAAACGCAAAAGCCATCAACA
TCATCTTGAATTGCCTTGGCAACGGCAACAGCTCCATGGCCATAAGCATTGGCCTTGACC
ACAGCCCACCTTGAGCGTTCTTGAGGGATATGAGCCCCCATTTGCTGAATATTTTGTCGA
ATAGCTCCCAGATGAATCAGAACCTTGGTTGGTCTATGTTGGACTAACTTTCATGATTTT
CCCTCCAAAATGACACTGGCTGTCAAACTGATCGGTGTTGGCTGAATAAACAGCCAAA
TCTTTTCCTGAAAAATGGTGGCCTGACT

ORF Predictions:

ORF #	Start	End	Direction	Length
8	1985	2371	R	129 aa

[SEQ ID NO:] 3864518-8 ORF translation from 1985-2371,
direction R

VRLSRLKICSQQHGV RVEGIFTHFATADEESDDYFNAQLERFNTILASMKEVPELVHASN
SATTFWHVETIFNAVRMGDAMYGLNPSGAVLNLPYDLIPALTLESALVSCQDSSSWSLHG
LWSNLSSG*

Blastp and/or MPSearch Result:

Description:

ALANINE RACEMASE (EC 5.1.1.1). - BACILLUS
STEAROTHERMOPHILUS.

Assembly ID: 3864522

Assembly Length: 1549bp

[SEQ ID NO:] 3864522 Strep Assembly -- Assembly
id#3864522

CCAGTTAAGGCTGGTTGTCGTTCCCTTCTGGTAAAGAGAACTTCCTTTGTAGAGCCTGCAT
TAATAAACTTACGAATGGTTTCACGAGCAGCTTCATAAGGAAGCTGTCGCTCGTTCCGCT
AAGGTATGGACACCACGGTGAACATTGGCATTGTCCTGCTCATAGTAACTGTTAATAGCT
TTCAGAACTACTAGTGGTTTTTGTGTCGTCGCAGCATTGTCCAGATAGACCAGAGGTTCA
TCATTGACAATCTGATCTAAAATTGGAAAATCCTTGCGAATCGCTTCTACATCTAACATA
GGCTTCCCCCTTAGCGTTTTGACAATTTCTCTTCGATAGTTGCAATCATTTTCATCACGAAC
TTCCTTGACTGGAATCTCCACGATAACAGATCCAAGGAAACCACGAACAACCAAACGCTC
TGCAGTTGCCTTATCCAATCCACGACTCATGAGGTAATACATGTCTTCTGGATCAACTTG
TCCGATAGACGCTGCGTGTCTGTCAGTGACATCATTTTCATCAATCAAAAGAATTGGGTT
AGCATCTGAACGCGCTTGGTCTGAAAGCATGAGAACACGGCTCTCTTGTGTCGCATCTGC
TCCCTTAGCACCCTTGATGATGTGGCCGATACCATTGAAAGTCAAAGTTGCTTTTTCAAG
GATAACCCCATGTTGTAGGATATTTCCGATAGAGTTGCAGCCATAGTTAGTTACACGAGT
ATCAATCCCTTGTACCTGACGACCACTTGAAAGAGCTACAACCTTGAGGTCAGCATGGCT
ACCATTACCAATCAAGTCACTATCAAAATCAGCAACGACATTTCTTTCGTTTCATGACACC

GATAGCCCAGTCAATACTTGCATCGTTGCCTAATTCCATACCACGACGGCTAATGTAGGC
 AGTGACGTTTTTCACCTAGACGGTCGATAGCAGCAAACCTTGACTTGCGCACCAGAACGTGC
 AATCACTTCCACTGTGATATTGGCAGTTACTTTGTCACTTCCTTCACCGCGTGA CTCTAA
 ACGCTCCAGATAACTAATCTTAGAATTTTTTACCAGCGATAATCATAATATGCTTGTTAAA
 CGGCACATTGCTATCGCTATCTTGGTAGAAAATTCCTTCAATTGGCTCTGTGATTTCTAC
 GTTATCTGGAATATAGAGTACAGCACCCTGTTAAAGTAAGCTGTGTGGTAAGCCGCCAA
 CTTGTCATCATCATACTTAACAGATGACATGAAGAATTCTTCGATCAGCTCTGGAATTTT
 TTCTAAAGCTGAGTGAAAGTCTGTGAAGACAACACCCTGTTTCACTCAACTCAACTGGAGT
 TTGTTTGAAAACAGTTTGAGTTCCTACTTGCACCAACTTCAAGTGATGATCTAAAGCTGT
 GAAATCTGGAACATTTGCTGATGGCTCATTTCTGTAAATCGTTCCATCACCCTAAATCCA
 ACGGGTGGAATTTGACACGCTCAATAACTGGTAATTCCTAAAGTCTCAATCTTGGTCAAAA
 AGCTTTTTTGACGGAAATCAGCCAACCAAGCTTGGTTCCAGCGGTGCATT

ORF Predictions:

ORF #	Start	End	Direction	Length
7	310	1458	R	383 aa

[SEQ ID NO:] 3864522-7 ORF translation from 310-1458,
 direction R
 VSNSTRWNLGDGTITGNEPSANVPDFTALDHHLKLVQVGTQTVFEQTPVELAEQGVVFTD
 FHSALEEIPELIEEFFMSSVKYDDDKLAAYHTAYFNSGAVLYIPDNVEITEPIEGIFYQD
 SDSNVPFNKHIMIIAGKNSKISYLERLESRGESDVKVTANITVEVIARSGAQVKFAAIDR
 LGENVYAYISRRGMELGNDASIDWAIGVMNEGNVVDFFSDLIGNGSHADLKVVVALSSGR
 QVQGIDTRVTNYGCNSIGNILQHGVIKATLTFNGIGHIIGKAKGADAQQESRVLMLSD
 QARSDANPILLIDENDVTAGHAASIGQVDPEDMYYLMSRGLDKATAERLVVRGFLGSVIV
 EIPVKEVRDEMIATIEEKLKR*

Blastp and/or MPSearch Result:

Description:
 unknown

Assembly ID: 3864568
 Assembly Length: 1548bp

[SEQ ID NO:] 3864568 Strep Assembly -- Assembly
id#3864568

CTTGGTAGAACTTGCTAATCAAGCTGGCAAGCCTGTAGTCTTGGACTGCTCAGGTGCAGC
ACTTTCAGGCTGTTCTTGAATCACCCATAAACCAACAGTCATCAAACCAAATAATGAAG
AATTGTCTCAGCCTTCTTGAAGAGAAGTTTCTGAGGATTTGGATGAATTAAAAGAAGTA
CTTCAAGAAACCTTTGTTTGCAGGGATTGAATGGATTATCGTTTCACTTGGTGCCAACGG
TACTTTTGGCAAACATGGTGACACTTTCTACAAGGTAGATATTCCTAGAATTCAGGTGGT
AAATCCTGTTGGATCTGGAGACTCTACTGTGGCAGGAATTTCTTCAGGACTTCTTCACAA
AGAATCGGATGCAGAATTACTCATCAAGGCAAATGTCCCTTGGTATGCTCAATGCTCAAGA
AAAAATGACTGGTCATGTCAACATGGCCAACTATCAAGTTCTATATGATCAATTAATAGT
AAAAGAGGTATAAAATGGCTTTAACAGAACAAAAACGTGCACGCTTAGAAAACTTTCTG
ATGAAAATGGTATCATCTCAGCTCTTGCATTTGACCAACGTGGTGCTTTGAAACGCCTCA
TGGCTCAACACCAAACAGAAGAACCAACTGTGGCTCAAATGGAAGAACTGAAAGTCTTGG
TAGCAGATGAATTGACTAAATACGCTTCATCAATGCTTCTTGACCCTGAGTATGGACTTC
CAGCAACTAAAGCTCTTGATGAAAAAGCTGGTCTTCTCCTTGCTTATGAAAAACAGGTT
ATGACACAACAAGTACAAAACGCTTGCCAGACTGCTTGGATGTTTGGTCTGCAAAACGTA
TTAAAGAAGAGGGTGCAGATGCAGTTAAATTCTTGCTTTACTATGATGTAGATAGTTCAG
ACGAACTCAACCAAGAAAAACAAGCTTATATCGAGCGTATCGGTTCTGAGTGTGTGGCTG
AAGATATCCCATTCTTCCTTGAAATCCTTGCTTACGATGAAAATCGAATTGCAGACGCAG
GTTCTGTAGAAATATGCGAAAGTAAACCACACAAAGTTATCGGTGCTATGAAAGTCTTTT
CAGACCCACGCTTTAACATTGATGTCTTGAAAGTTGAAGTTCCTGTTAACATTAAATATG
TTGAAGGCTTCGCTGAAGGTGAAGTGGTTTACACACGTGAAGAAGCAGCAGCCTTCTTCA
AAGCGCAAGATGAAGCAACGAACTTGCCATACATTTACTTGAGTGCTGGTGTATCAGCTA
AACTCTTCCAAGATACTCTTGATTTTGCTCATGAATCAGGTGCAAACCTTTAACGGAGTTC
TTTGTGGCCGTGCTACATGGGCAGGATCAGTTGAAGCTTACATCAAAGATGGTGAAGCAG
CAGCTCGCGAATGGCTTCGCACAACTGGATTTGAAAACATTGATGAGCTCAATAAAGTTC
TTCAAACAACAGCGACTTCATGGAAAGAACGTGTGTAAGAAAGTCCTCCTAGTTTAGGAA
CATGAATCTAAAAAATTCAAAAAAAGTTGTATGTAAAGGTTTACAAA

ORF Predictions:

ORF #	Start	End	Direction	Length
6	296	493	F	66 aa

[SEQ ID NO:] 3864568-6 ORF translation from 296-493,
direction F
VVNPVSGDSTVAGISSGLLHKESDAELLIKANVLGMLNAQEKMTGHVNMANYQVLYDQL
IVKEV*

Blastp and/or MPSearch Result:

Description:

TAGATOSE-6-PHOSPHATE KINASE (EC 2.7.1.-)
(PHOSPHOTAGATOKINASE). - LACTOCOCCUS L ACTIS (SUBSP.
LACTIS) (STREPTOCOCCUS LACTIS).

Assembly ID: 3864590

Assembly Length: 1360bp

[SEQ ID NO:] 3864590 Strep Assembly -- Assembly
id#3864590

CTTCCTCCAGCAAAATCCACTGCTGAGAAGCTAAAGGGAGCGTGAGATAGCCCTCTTTCT
CTACTGGTTGGTCTGAAATCCGAGCCTCAGGAAACCAGTCTTGTTAGTTCTTTTTCCCTCA
TGTTCTAGCCCTCCACTTTTGGATGCACCATGAAACCAAACCTCTCAAGACGTTCCAGAT
TCTCAGTCATATGGAGATAGCCCATAACCGCTTCAAATCCCGTGGACATACGATAAGTCA
CGACATCTGCATTTTTAGCCTTTGTGTGGCTATTGGTATTGCGGCCACGTTTGTAGATTT
CTTCTTCTTTTTCCGTTAGGACCTGCTCCTCCAACATGAGAGCAATCAGGCGAGCCTGAG
CCTTGGCTGACACATACTTGGTTGCTTCTTGATGGAGTTTATTGGGTTTGGTCATACCTT
TGAGGATGAGGTGACGGCGAATATACATAGAATACACCGCATCCCCCTCAAAGGCTAGCG
CAATCCCGTTAATGAGATTGACATCAATCACGTGTCCACCTCACTCCATCCTTGGTATCA
AGGAGCTTAATTCCTTGAGTAACCAATTGGTTCACGGATTTGGTCTGCTGTCTCAAAGTCT
CGATTGGCACGCGCCTCTTGGCGTTTGTGAATCAAGTCTTCAATCTCTGCATCCAAACT
TCCTCAACAAAGACAATTCCAAAAATTTCTAACATATCTGCAAGAGCTTGCTTGACACTT
GCATCATAGTTCCCTGAGTTGATCCATTTGGCCATTTCAAAGACAACGTGTGATACCGTTG
GCAGCATTAAAATCTTCATCCATAGCTGCTACAAACTTATCTTTAAAGTTTGTAACTCT
TGGGCATCCACGTTTCTGTAAATGGTTGTCGTAAGTATTCTTCAGATACTTGAGATTG
GTCTCGGCATCGCGAACTGCCTTTTCCGTGAAGTTGATAGGCTTACGGTAGTGCTGGGTC
GCAAAGAAGAAACGAAGTACTTGCCCATCAAGAGTTTTAAGGGCATCGTGTAACGTAATG
AAGTTACCCAAGGACTTAGACATTTTGACATTGTGATATTGACAAAGCCATTGTGCATC
CCAGTTAGTTAGCAAAAGCCTTGCCCTGTTTTAGCTTCAGATTGGGCAATTTTCATTGGTGT
GGTGTGGAACTCTAGGTCAGCTCCACCACCGTGGATATCAATGGTATCACCTAAAATCT
CTGTGACATGACTGAACACTCAATATGCCAACCCGGACGTCCAGGTCCCCAAGGACTAT
CCCAAGAAATCTCACCTGGTTTGGGAAGATTTCCATAAAGCAAAGTCTACAGGATTTTCCT
TACGAGCCGTTTCTTCATCGGTACGACCTGAAGCACCTAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	125	511	R	129 aa

[SEQ ID NO:] 3864590-6 ORF translation from 125-511,
direction R
VIDVNLINGIALAFEGDAVYSMYIRRHILKGMTKPNKLHQEATKYVSAKAQARLIALML
EEQVLTEKEEEIYKGRNTNSHTKAKNADVVTYRMSTGFEAVMGYLHMTENLERLESLSVS
WCIQKVEG*

Blastp and/or MPSearch Result:

Description:
unknown

Assembly ID: 3864596
Assembly Length: 2130bp

[SEQ ID NO:] 3864596 Strep Assembly -- Assembly
id#3864596
TTGACAAACGGTACTTATGTAGTGGACAGCACTATCGGAGCAGGAGCGGTCATTACCAAT
TCTATGATTGAGGAAAGTAGTGTTCAGACGGTGTGACAGTCGGTCCTTATGCTCAACAT
TCGTCCAAATTCAGTCTGGGTGCCCAAGTTCATATTGGTAACTTTGTTGAGGTGAAAGG
ATCTTCAATCGGTGAGAATACCAAGGCTGGTCATTTGACTTATATCGGAAGCTGTGAAGT
GGGAAGCAACGTTAATTTCCGTGCTGGAACATTTACAGTCAACTATGACGGCAAAAACAA
ATACAAGACAGTCATTGGAGACAATGTCTTTGTTGGTTCAAATTCACCATTATTGCACC
AGTAGAACCTTGGTGACAATTCCCTCGTTGGTGCTGGTTCAACTATTACTAAAGACGTGCC
AGCAGATGCTATTGCTATTGGTCGCGGTCTGTCAGATCAATAAAGACGAATATGCAACACG
TCTTCCTCATCATCCTAAGAACCAGTAGGAGCCTATCATGGAGTTTGAAGAAAAACGCT
TAGCCGAAAAGAAATCTATCAAGGACCAATATTTAAACTGGTCCAAGATCAGGTTGAATT
ACCAGAAGGCAAGGGAAGTGCCTAACGGGATTTGATTTTCCACAATGGGGCTGTCTGTGT
TTTAGCAGTAACGGATGAACAAAACTTATCTTGGTCAAGCAGTACCGCAAAGCTATCGA
GGCTGTCTCTTACGAAATTCAGCCGGAATTTGGAAGTAGGAGAAAACACAGCCCCTGT
GGCAGCTGCCCTTCGTGAATTAGAGGAAGAAACAGCCTATACAGGGAAATTAGAACTCTT
GTACGATTTTATTACGCTATTGGCTTTTGTAAATGAGAAGTTAAACTATATTTAGCAAG
CGATTTGACAAAAGTGGAATCCGCGTCCCGCAGGATGAGGATGAAACCTTGGAAGTCCT

TGAAGTGAGCTTAGAAGAAGCGAAAGAATTAATCCAATCAGGTCATATTTGTGATGCCAA
 GACAATTATGGCTGTTTCAGTATTGGGAGTTGCAGAAAAAATAGAGGAGGTCAGTATGGGT
 AAATCTTTATTAAACGGATGAAATGATTGAAAGAGCTAATAGAGGCGAAAAAATTCAGGT
 CCTCCTTTGCTAGATGATAATGAGGAACTAAGATTTTACCAACCTCTTCTTCCCGTTTT
 GGTTATGCCAATCCTAAGGATCATGGTTTTAGCCAGGAAACCTTGAAGATTCAGGTCGAA
 CCATCTATTTCATAAAAGCCGTCGTATTGAAAATACCAAGAGAAATGTCTTCAATTCTAAG
 TTGAATAAAATCTTATTTGCGGTCATCTTCTCTTGATTTTGCTTGTTTTAGCAATGAAA
 CTTTTGTAATAGAAAAGGAATTGAAATGAAAATAGGAATTATTGCTGCTATGCCAGAAGA
 ACTGGCTTATCTGGTCCAGCATTTAGATAATGCCCAGGAGCAAGTTGTTTTGGGGAATAC
 CTATCATACAGGAACCATTTGCTTCTCATGAAGTCGTTCTTGTAGAAAGTGGAATTGGTAA
 GGTCTATGTCTGCTATGAGTGTGGCGATTTTGGCTGATCATTTCCAGGTGGATGCCCTTAT
 TAATACGGGTTTCAGCTGGGGCAGTAGCAGAAGGTATCGCTGTTGGGGATGTCGTGATTGC
 TGACAAATTAGCCTATCATGACGTGGATGTCACAGCTTTTGGCTATGCTTATGGACAAAT
 GCGCAACAACCGCTTTATTTTGAATCAGACAAACCTTTGTTGCTCAAATCCAAGAGAGT
 TTATCTCAATTGGACCAAACTGGCATCTTGGTTTGATTGCTACAGGAGATAGTTTTGTT
 GCAGGAAATGACAAGATAGAAGCGATTAAAGTCCCATTTCCCAGAAGTTTATGCCGTGGAG
 ATGGAGGGGGCAGCTATTGCTCAAGCAGCGCATGCCCTCAATCTCCAGTCTTAGTCATC
 CGAGCTATGAGTGACAATGCCAACCATGAAGCAAACATCTTTTTTGTATGAGTTTATTATC
 GAAGCTGGACGTCGCTCTGCCCAAGTCTTGTGGCCTTTTGAAGGCTTTAGATTAAGCG
 GAAATTTGACAGTTTTTCTAGATCAAGCTT

ORF Predictions:

ORF #	Start	End	Direction	Length
11	1915	2097	F	61 aa

[SEQ ID NO:] 3864596-11 ORF translation from 1915-
 2097, direction F

VEMEGAIAQAHAHALNLPVLVIRAMSDNANHEANIFFDEFIIEAGR RSAQVLLAFLKALD

*

Blastp and/or MPSearch Result:

Description:

PFS PROTEIN (P46). - ESCHERICHIA COLI.

Assembly ID: 3864624

Assembly Length: 2128bp

[SEQ ID NO:] 3864624 Strep Assembly -- Assembly
id#3864624

ATCGAATTTGAGTTTGTAGGCTTGGATAACTATATCCGTATGTTTAAAGATCCTGTCTTT
ACAAAATCTCTGATTAACACAGTTATTTTGGTTATTGGATCTGTACCAGTTGTTGTTCTA
TTCTCACTCTTTGTAGCATCTCAGACCTATCATCAAAATGTCATTGCCAGATCCTTCTAC
CGTTTCGTCTTCTTCTTCTGTTGTAACGGGTAGTGTGCCGTGACAGTTGTTTGGAAA
TGGATTTATGACCCACTATCAGGGATTCTAAACTTTGTCCTTAAGTCAAGCCACATCATC
AGCCAAAACATTTCTTGGTTGGGAGATAAAAACTGGGCATTGATGGCGATTATGATTATT
CTCTTGACCACTTCAGTTGGTCAGCCCATCATCCTTTATATCGCTGCCATGGGGAATATT
GACAATTCAC TGTTGAAGCGGCGCGTGTGATGGTGCAACTGAGTTTCAAGTTTTTTGG
GAAGATTAAATGGCCAAGCCTTCTTCCAACAACCTCTTTATATTGCAATCATCACAACAAT
TAACTCATTCAGTGTTTCGCCTTGATTGAGCTTTTGACATCTGGTGGTCCAAACTACTC
AACAAGTACCTTGATGTACTACCTTTACGAAAAAGCCTTCCAATTGACAGAATACGGCTA
TGCCAACACAATTGGTGTCTTCTTGGCAGTCATGATTGCTATCGTAAGCTTTGTTCAATT
TAAAGTACTTGGAAACGACGTAGAATACTAAAGAAAGGAGACAGCTATGCAATCTACAGA
AAAAAAACCATTAAACAGCCTTTACTGTTATTTCAACAATCATTTTGCTCTTGTTGACTGT
GCTGTTTCATCTTTCCATTCTACTGGATTTTGACAGGGGCATTCAAATCACAACCTGATAC
AATTGTTATTCCTCCTCAGTGGTTCCTTAAATGCCAACCATGGAAAACCTTCCAACAAC
CATGGTGCAGAACCTGCCTTGCAATGGATGTGGAACCTCAGTATTTATCTCATTGGTAAC
CATGTTCTTAGTTTGTGCAACCTCATCTCTAGCAGGTATGTATTGGCTAAAAACGTTT
CTATGGTCAACGCATTCTATTTGCTATCTTTATCGCTGCTATGGCGCTTCCAAAACAAGT
TGTCCTTGTTACCATTTGGTACGTATCGTCAACTTCATGGGAATCCACGATACTCTCTGGGC
AGTTATCTTGCCCTTTGATTGGATGGCCATTCGGTGTCTTCCTCATGAAACAGTTCAGTGA
AAATATCCCTACAGAGTTGCTTGAATCAGCTAAAATCGACGGTTGTGGTGAGATTCGTAC
CTTCTGGAGTGTAGCCTTCCCGATTGTGAAACCAGGGTTTGCAGCCCTTGCAATCTTTAC
CTTCATCAATACTTGGAAATGACTACTTCATGCAGTTGGTAATGTTGACTTCACGTAACAA
TTTGACCATCTCACTTGGGGTTGCGACCATGCAGGCTGAAATGGCAACCAACTATGGTTT
GATTATGGCAGGAGCTGCCCTTGCTGCTGTTCCAATCGTCACAGTCTTCCTAGTCTTCCA
AAAATCCTTCACACAGGTATTACTATGGGAGCGGTCAAAGGATAATACTCTGCGAAAAT
CGAATGCAAACTACGTCAGCTTCACCTTGCCATACTTAAGTATTGCCTGTGGTTAGCTTC
CTAGTTTGTCTTCAATTTTCATTGAGGTATAGGAAAATCAATCTATCAAGATACAGAAG
TATATTTTATAGATTTAGAGAATATAGAAGTTATAAGTGTCTACAAAATGGAGGGTATGC
AGTTACTTTATGAAGTTTTGTCAGACACTTATAAACTTAAGAATGGTTTTAGTTAACTAT
CAGAAAACGAAGGAAAGAGTATGATTTTTGACGATTTGAAAAACATCACCTTTTACAAAG
GGATTCATCCCAATTTAGACAAGGCTATCGACTATCTCTACCAACATCGTAAAGATTCAT
TCGAATTAGGAAAGTATGAGATTGATGGAGATAAAGTCTTTCTAGTTGTTTCAGGAAAATG
TCCTCAATCAAGTTGAGAATAATCAATTTGAACACCATAAGAACTATGCAGATTTGCATT
TGCTGATAGAAGGGCATGAATATTCGAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	446	751	F	102 aa

[SEQ ID NO:] 3864624-6 ORF translation from 446-751,
 direction F
 VLMVQLSFKFFGKIKWPSLLPTTLYIAIITTINSFQCFALIQLLTSGGPNYSTSTLMYYL
 YEKAFQLTEYGYANTIGVFLAVMIAIVSFVQFKVLGNDVEY*

Blastp and/or MPSearch Result:

Description;

MULTIPLE SUGAR-BINDING TRANSPORT SYSTEM PERMEASE PROTEIN
 MSMF. - STREPTOCOCCUS MUTANS.

Assembly ID: 3864630

Assembly Length: 1773bp

[SEQ ID NO:] 3864630 Strep Assembly -- Assembly
 id#3864630

ATCGAATTATATATAAAAATCTTACACATTAGAAAAGGAGGTTTCCCATGTACTTTCCAA
 CATCCTCTGCCTTGATTGAATTTCTCATCTTGGCCGTACTGGAGCAGGGTGATTCTTATG
 GTTATGAGATTAGCCAAACCATTAAGCTAATCGCTAATATCAAAGAATCCACACTCTATC
 CCATTCTCAAAAAATTGGAAGGCAATAGCTTTCTGACAACCTATTCTAGAGAGTTCCAAG
 GTCGCATGCGCAAATACTACTCCTTGACAAACGGTGGTATAGAGCAGCTCTTGACCCTAA
 AAGATGAATGGGCACTCTATACAGACACCATCAATGGCATCATAGAAGGGAGTATCCGCC
 ATGACAAGAACTGAATACCTGACTCAGCTAGAACTCTATCTCAAGAACTACCTGAAGCT
 GACCGTATCGAAGCCATGGACTATTTTCAGAGAGCTCTTTGACGATGCTGGAGTCGAAGGA
 GAAGAAGAACTCATCGCTAGTTTGGGAACCTCCAAAGAAGCGGCCACGAAGTTCTATCCA
 ATCTTCTCGATAAAAAAATCAATGAAGCACCCGCTCAAAAAAATAACCGACAAATTTTAC
 ATATCGCCTTGTTAGCCCTCCTTGACGACCTATCGGCATTCTCTGGGAATCGCCATCC
 TCGTGACCTGTTCGCAATCCTTGTAGCCGCTTTGACTGTCAATTCTGGCTTTCTTTGCAG
 TTTCCATACTGGGTATCATCGGCGGATTCCATTTTTAGTTGAAAGTTTCACTATCCTCG
 CCCAAGCCAAATCAGCCTTTATCTTGATTTTTGGTTCTGGTTTACTGGCTATCGGTGCTT

CTTCGCTAGTTTTACTTGGCATTTCCTATGTAGCTCGCTTCTTCGGTCTACTCATTGTTC
 GTCTGGTACAATTTGTTCTTAAAAAGGAAAGAGAGGTAATCAGCATGCGTAAATGGACA
 AAAGGATTTCTCATCTTTGGTGTGGTGA CTACCGTTATCGGCTTTATCCTGCTTTTTGTA
 GGTATCCAATCTGACGGGATTAAGAGTCTACTTTCCATGTCCAAAGAACCTGTCTATGAT
 AGCCGTACGGAAAAGCTAACCTTTGGCAAGGAAGTCGAAAACCTAGAAATTACTCTCCAC
 CAACACACGCTCACCATCACAGACTCTTTTCGATGATCAAATCCACATTTCTTACCATCCA
 TCTCTTTCTGCTCACCATGATTTTATCACCAATCAGAACGATAGAACTCTGAGTCTCACT
 GATAAGAACTGTCTGAACTCCGTTTCTCTCTTCTGGAATTGGTGGGATTCTTCATATC
 GCAAGTAGCTACTCTAGTCGTTTTGAAGAAGTTATTCTCCGACTACCAAAGGGAGAACT
 CTAAAAGGGATCAACATCTCAGCCAATCGCGGACAAACCACCATCATAAATGCTAGCCTT
 GAAAAATGCGACCCCTCAATACAAACAGCTATATCCTCCGAATTGAAGGAAGTCGTATCAAA
 AACAGTAAACTCACACGCCCAATATCGTTAATATCTTTGATACAGTTCTTACAGATAGT
 CAGCTAGAGTCAACAGATAATCACTTCCACGCTGAAAATATCCAAGTCCATGGTAAGGTT
 GAACTGACTGCCAAAGATTATCTCAGAATCATCTAGACCAGAAAGAAAGCCAACGAATT
 AACTGGGACATCTCAAGTAACTACGGTTCTATCTTCCAATTCACAAGAGAAAAGCCTGAA
 TCAAGAGGTACGGAATTAAGCAACCCTTACAAA

ORF Predictions:

ORF #	Start	End	Direction	Length
8	663	953	F	97 aa

[SEQ ID NO:] 3864630-8 ORF translation from 663-953,
 direction F
 VTLFAILVAALTVILAFFAVSILGIIGGFLFLVESFTILAQAKSAFILIFGSGLLAIGAS
 SLVLLGISYVARFFGLLIVRLVQFVLKKGKRGNQHA*

Blastp and/or MPSearch Result:

Description:
 unknown

Assembly ID: 3864654
 Assembly Length: 2307bp

[SEQ ID NO:] 3864654 Strep Assembly -- Assembly
id#3864654

CCACCTTGATGTTTCTAAACGTTTCGCAAGAATTAGAAGAACAGTTAGCGAAAAATAGAG
CCTTGGAAGAGACGTTTACTGAGTCGACTCGAATTTCAAAAGTAGAAGCGCAGAAGAAGG
AAAAAGAACGTTTGTAGAGGAATTGACCTTCTTGCAGGAATATATAGATGTAGGTCAAG
CGAGAGTTCCTTTAGCGGCTACTTTGAGTTTGGAAATTTGGTACTACCTCTGTCAATATAT
ATGCTGGTATGGATGATGATTTTAAACGTTACAATGCACCAATTTTAACATGGTATGAAA
CGGCTCGCTATGCCTTTGAGCGAGGTATGGTCTGGCAAAATTTAGGTGGTGTGAAAAC
CTCTCAATGGTGGACTTTATCATTTTAAGGAAAAATTTAATCCAACGATTGAAGAATACT
TGGGTGAATTTACAATGCCCACTCATCTCTCTATCCTCTGTTAAGACTTGCTCTTGATT
TCCGTAAAACATTAAGAAAAAACATAGAAAGTAAGTATATGGCACTAACAACTCAGC
AAAGAAGAGTTTCAGACTTATTCTGATCAGGTTTCTTCTCGTTCCCTTTATGCAATCTGTC
CAGATGGGGGATTTGCTAGAAAAAGAGGGCTCGAATTGTTTATCTTGCTTTGAAACAA
GAAGGAGAAATTCAGTTGCAGCTCTGGTTTATAGCTTGCCCATGGCTGGGTGGTCTGCA
TATGGAACCTCAATTCGGGGCCGATTTATACCCAACAAGATGCTCTTCCAGTTTTTATGC
AGAGTTAAAAGAATATGCCAAGCAAAATGGTGTATTAGAGTTGCTTGTAACCTTATGA
AACTTATCAAACTTTTGATAGCCAAGGTAATCCAATAGATGCTGAGAAAAAAGTATTAT
TCAAGGTTTGACTGATTTAGGTTATCAATTTGATGGCTTAACAACAGGTTACCCAGGTGG
AGAACCAGATTGGTTATACTATAAAGATTTAACTGAATTAACGAAAAGAGTTTGCTTAA
AAGTTTTAGCAAAAAGGGTAAACCCTTGGTGAAAAAGGCTGAAACCTTTGGCATTTCGGTT
GAAAAAGTTAAACGTGAAGAACTATCGATTTTAAAGATATAACAAAAGAAACCTCTGA
ACGTAGAGAATATAGTGATAAAAGTTTAGAATATTATGAGCATTTTTATGATACTTTTGG
AGAACAAGCGGAGTTTCTCATAGCAAGCTTGAATTTTTCGGAGTATATGAGCAAATTGCA
AGGTGAACAAAGTAACTAGAAGAAAACCTGGACAAGTTGCGACTTGATTTGAGTAAAAA
TCCTCATTTCTGAGAAAAAACAAATCAACTGAGAGAATATTCTAGTCAATTTGAAACGTT
TGAAGTTCGAAAAGCAGAAGCGCGAGACTTGATTGAAAACGATATGGAGAAGAAGATATT
GTTTTAGCTGGGAGTTTATTTGTTTATATGCCTCAGGAAACGACTTATCTCTTTAGTGGT
TCCTACACTGAGTTTAAATAAGTGCTATGCCCCTGCACTGCTTCAAAAATATGTTATGTTG
GAAAGCATAAAACGTGGAATACCTAAATACAATTTCTAGGCATTCAAGGGATTTTTGAT
GGAAGTGATGGTGTTTTGCGTTTTAAACAGAATTTTAATGGCTATATTGTACGCAAAGCG
GGTACTTTCCGTTACCATCCATCGCCTTTAAAATACAAAGCTATCCAGTTACTCAAAAAA
ATAGTAGGACGTTAAGATGAAAAGTCAGTATTTAGATTTCTTTTAGCTTCTTTTAGTAA
AATCGAATTTTTATTTGCTAGAAAGGTGGAGAGACATGCGCTGGCTTTTTCGTTTGATAG
GGGCTTTCTTTTTTTTTGTGTGGCGTTTGTTTTGGCGTCTGGTTTGGATAGTTGTGCTCT
TATGTGTGCTTGCTTTCGGACTTCTCTGGTATTTGAACGGGGATTTTCAAGGAGCGCTAA
AGCAAGCAGAACGGTCAGTAAAAATTGGTCAACAAAGTATTGACCAATGGGAGAAAACAG
GGCAACTGCCTAAGTTAAGCCAGACAGATAGTCACCAGCATTCTGAAGGAAGGTGGCCAC
AGGCCTCTGCTCGTATTTACCTGGATCCGCAGATGGATTACAGCTTTCAAGAGGCTTATT
TAGAAGCAATCCAGAACCTGGAATCAAACCTGGTGCTTTTAACTTTGAACTCGTGACTGAAT
CTAGTAAGGCGGATATTACGGCTACGGAGATAACGACGGAAGCACTCCTGTGGCAGGAGA
AGCGGAAAGTCAAACCTAATCTCTTAAC

ORF Predictions:

ORF #	Start	End	Direction	Length
9	1878	2306	F	143 aa

[SEQ ID NO:] 3864654-9 ORF translation from 1878-2306,
direction F

VWRLFWRLLVWIVLLCVLAFGLLWYLNQDFQGALKQAERSVKIGQQSIDQWEKLGQLPKL
SQTDSHQHSEGRWPQASARIYLDPMDSRFQEAYLEAIQWNQTFGAFNFELVTESSKADI
TATEITTEALLWQEKRVKLIS*

Blastp and/or MPSearch Result:

Description:

unknown

Assembly ID: 3864658

Assembly Length: 1236bp

[SEQ ID NO:] 3864658 Strep Assembly -- Assembly
id#3864658

TTCCCATAAATATTCCTGTNCTTCACCAGAATTGAGATAAATGATTGTATTTCTCATTTAA
TGATTGTTCAAATTTGTGAAAGATAGCTTCTTTTGGACGTAACCTCTCCAATTGTTTATT
TAAAGAGCTCGCTTGTAACCTTCTTGTCCACTTGATAACGAAATAATGACATCTCCAGC
ATTTACCATATCTCCTTCTGACTTATGTAAAGTAACTACCTTCCCTGAACCAATTGCTGA
TAGGAACTCTGTACCTGTTATAACTGAATTTCCATTTCGCTTTTACAATATAGTTTTTGGG
TATATAAGCTGCGCCAACCAATGCACCGCTTAAGATAATAGCAGTTGAAATAATGAGAAT
AAACGCAAAAGCTGGTGGTCTCTTATCAAAGAAAATACGAGAATAACGTAATTCTGATTT
ATTATATAATTTTCATAGGCTTACAATTGGTCTAAAAATATCTACTACCATTTTTTTCAGGA
GAAGAATTAACATAAACTGTATAGACAATCCCATCCGTTTGAATATCATTTTCATAGACA
TATAGATCCAATTTAGAATACGCATACTGTAGATACTCTGGACTGTCTTCAAAACGAACA
TATAAACAATATGGAACAGAGATAGAATCCTGTACATCATAAATGTTACTGTACTGTTGA
GCATTATGAGCTTGAATATAAACTCAAAATCAGTCGTTATTAATCCATCATCATGAATA
GTAGTACCACAACCTTTTACAATTAATGGACCAAAAATTTGTGCTTTTAAACAACGCAAA
TGTTGATGAAATTTATTAATTTCCCTAATCAACATCTTCTACTTTNGTATCATGTAACCTT
TTACAGATAACTGACTTTAGTACCAGTTTTTTTATTATCTTTTACCTCTAACTTAGCCATA

AGTAACCTCCTCTGTATCTAACACAGCCTGTGACTGAATTTGTTGATTCACTTGAACGCT
 CTGCAAACCAACCATTCTAGCATACTTTCCATTTTTCGCCATTAGTTCTTCATGAGTCCC
 ATATTCCACAATAGTCCCATTTTCTAAAAAGCATATCTTATCACATCGAAGAATTGTAGA
 CAGCCTGTGGGCTACTACAATTGTTGTCTTATCCATTATTTTATTAAAGATTAAATCCTG
 AATAATCTGTTCACTAAATGAATCTAAGTTAGAGGTTGCCTCATCAAATATATACAAATC
 AGCTTTACTCAGTAGTGCTCTTGCAATAGCCAATCG

ORF Predictions:

ORF #	Start	End	Direction	Length
7	892	1029	R	46 aa

[SEQ ID NO:] 3864658-7 ORF translation from 892-1029,
 direction R
 VEYGTHEELMAKNGKYARMVGLQSVQVNQQIQSQAVLDTEEVTYG*

Blastp and/or MPSearch Result:

Description:
 unknown

Assembly ID: 3864664
 Assembly Length: 2124bp

[SEQ ID NO:] 3864664 Strep Assembly -- Assembly
 id#3864664
 CCTCGTTATGCAGATGAACGTTATTTCTTGTCAAAGAGTCACAAGAATTTGTTGATCGT
 AATCTTTTTATTACCATTCGTGACAAGGAAACCACCTGTATCAAGCCTTATCAGCAGGAT
 TTGGATTGCCACATGGTCTGGCCTTGATGTTTTGCCTTTGGATTATTATCCGAAAAAT
 CCAGCTGAGCGGAAAAACNGGTTGTTGAGCCTTGATTTATCACTCTTTTGTGCGCAA
 ACTATTCCAGAAAAGCATGGTGCTCTCATGAAATGGGGAAGTCGCATTTTACTGGGTTTG
 ACTCCAAAATCTCTCCGTTATCGCATCTGGAAAAAGCTGAGAAAGAAATGACTAAGTAT
 GATTTGGCTGATTGTGATGGCATTACAGAATTATGCTCAGGTCCTGGCTACATGAGAAAC
 AAGTACCCAATCACATCTTTTGAAGACAATCTTTTCTTGCCATTTGAAGGAACAGAGATG
 CCTATTCCAATCGGCTATGATGTCTATCTCAGAACTGCTTTTGGGGATTATATGACGCCT

CCACCAGCAGACAAGCAGGTACCGCATCAGGATGCTGTCATCGCTGATATGGATAAGTCT
TATACAGAAATACAAGGGAGAATATGGTGGCTAAGAAAAAATCTTATTTTTTATGTGGTC
TTTTTCTCTTGGAGGTGGTGCAGAGAAGATTCTATCAACCATTGTTTCAAATCTGGATCC
AGAAAAGTATGATATTGATATTCCTTGAAATGGAGCACTTTGACAAGGGATATGAATCTG
TTCCAAAGCATGTACGCATTTTAAATCCCTTCAAGATTATCGCCAAACCAGATGGTTAC
GAGCTTTTTTGTGGAGAAATGAGAATTTATTTTCCAAGACTGACTCGTCGTTTGCTTGTA
AAGATGATTATGATGTTGAAGTTTCTTTTACCATTATGAATCCACCACTGTTGTTCTCTA
AAAGAAGAGAAGTCAAGAAGATATCTTGGATTCTATGGAAGTATTGAAGAACTTCTTAAGG
ATAGCTCTAAAAGAGAAATCACATAGAAGCCAGTTGGATGCTGCGAATACAATTGTAGGGA
TTTCAAAAAAGACCAGCAATTCTATCAAGGAAGTTTATCCAGATTATGCTTCTAAATTAC
AGACAATCTACAATGGATATGATTTTCAGACTATTCTAGAAAAATCTCAAGAGAAGATCG
ATATCGAGATTGCTCCTCAAAGTATCTGTACTATCGGACGGATTGAGGAAAAATAAGGGTT
CTGACCGTGTAGTGGAAGTGATACGATTATTACACCAAGAGGGAAAAAATCATCTCTCT
ATTTTATCGGGGCTGGTGATATGGAAGAGGAACGTGAAAAAACGAGTCAAAGAGTATGAGA
TTGAGGACTATGTACATTTCTTGGTTATCAAAAAATCCTTATCAGTATTTATCTCAGA
CGAAAGTTCTCTTGTCTATGTCTAAACAAGAAGGCTTTCTGGAGTGATGTGGAGGCCT
TGAGTCTGGGACTCCCTTTTATCTCTACGGACGTTGGAGGGGCTGAGGAATTATCCCAAG
AAGGACGATTTGGACAAATCATTGAGAGCAATCAAGAGGCAGCTCAGGCGATTACTAATT
ACATGACTTCTGCCTCAAACCTTTAATGTCGATGAGGCTAGCCAATTCATTCAACAATTTA
CAATTACAAAACAAATCGAACAAGTAGAAAACTATTAGAGGAGTAGCATGGAACTGCA
TTAATTAGTGTGATTGTGCCAGTCTATAATGTGGCGCAGTACCTAGAAAAATCGATAGCT
TCCATTCAAGAGCAGACCTATCAAATCTGGAAATTATTCTTGTTGATGATGGTGCAACA
GATGAAAGTGGTCGCTTGTGTGATTCAATCGCTGAACAAGATGACAGGGTGTCACTGCTT
CATAAAAAGAACGAAGGATTGTGCGCAAGCACGAAATGATGGGATGAAGCAGGCTCACGGG
GATTATCTGATTTTTTATTGACTCCAAATGATTATATCCATCCCAAGAAATGATCCAGACC
TTATATAACCAATTAATTCGAAGAAGATGCCGGATGTTCCAAGCTGTGGTGTTCATGAA
TGTCTCTGCTAATGATAAAACCCC

ORF Predictions:

ORF #	Start	End	Direction	Length
7	675	1727	F	351 aa

[SEQ ID NO:] 3864664-7 ORF translation from 675-1727,
direction F

VVQRRFYQPLFQIWIQKSMILIFLEMEHFDKGYESVPKHVRILKSLQDYRQTRWLRFLW
RMRIYFPRLTRLLVKDDYDVEVSFTIMNPPLFSKRREVKKISWIHGSIEELLKDSSKR
ESHRSQLDAANTIVGISKKTNSIKYVDPYASKLQTIYNGYDFQTILEKSQEKIDIEIA
PQSICTIGRIEENKGS DRVVEVIRLLHQEGKNYHLYFIGAGDMEEELKKRVKEYEIEDYV
HFLGYQKNPYQYLSQTKVLLSMSKQEGFPGVYVEALSLGLPFISTDVGGAEELSQEGFRG

QIIESNQEAAQAITNYMTSASNFNVDEASQFIQQFTITKQIEQVEKLEE*

Blastp and/or MPSearch Result:

Description:

amsK protein - *Erwinia amylovora*

Assembly ID: 3864700

Assembly Length: 1660bp

[SEQ ID NO:] 3864700 Strep Assembly -- Assembly
id#3864700

ATCGAATTAAATCCATAAACAGATTTGGTGATTTGATAGACGACATTGGACAGTTTGCGA
TCTGGCAAGACAGAATGTTTGGTCAAACGGCTCAACATGGTCTTACGAATAGCCTGAAAG
ACTTCTGGATTTCCCTGCTGAATATAGGTCCACAATTGGCGTTTTTTTGCCAGATGCTCC
GCTGTTTCAGATCGGTTGAGCAGGGTACTGGAAATCACCGTCGTGATTTCAATATGATTC
AGCAGATATTCTCGCATTTTGGGATGACTCACTTGGGACAAATCAAGCTGGTCTACCAAG
AGTCGATTGACCTTGAGTTGCTGGTCAATGCACTTAATCATCACTTGCTCATTTGACAGAC
TGGTCCTCACGCCCAATCAAGTAACGATAGAAATCGACAGGCAGATAGTACATGGTCTTG
ACCTGCTGAAGGGGCGTAAAGACAAAGAGATTATCGACATAAAAAAGTATGTTTCAGGCAGT
TAGAACTGGCTAGCACGCAACAAATCTGTCCGATAAATCAGCGAGTGCATCATGATATAC
TGGCCTTTGGAGAAATTTCCGACCTGGTCCCAGCCAAAAATCTGCCGAACAGGCAAGACT
GACTCGTAACCTCATACTCTTCTTACGAGACTGACCTTCCTTTTCATAGACAAAATTGGTC
ACAAAGACATCCATCTCTTGACCCTTGCTCTCAAGTTCCTGCAAGGTTTCAAGAATTTTC
AAGTAGGCACGAGGATCCACCAGTCATCACTGTCAACTACTTTAAAAATAGCGCCCAGAAG
CCTCTGCCAAGCCGCGATTGACCACACCGCCATGGCCTTTATTTTCCTGATAGATGGCTC
TAACGATATTAGGATACTTGCTAGCTAAACACTCAGCGATTTCTTGAGTCTGGTCTGAG
ACCCGTCATTGATAATCAAAATCCCAACTTGCTCACCACCAATCACTAGCGACTCCACAC
AGTAATGAAGATAGGCTGCTGCATTATAGCTAGAAATGGCGATAGACAATAACTTCATAA
TCTGCTCCTTTAGGGGACTGATTTTTTCTTATACTCTTCGAAAATCTCTTCAAACCGCGT
CAACGTCGCCTTGCCGTATAGATGTTACTGACTTCGTCAGTTCTATCTGCAACCTCAAAA
CAGTGTTTTGAGCAGCCCGCAGCTAGTTTCCTAGTTTGATCTTTGATTTTCATTGAGTAT
TACTCTCTCTTGTCACCTTCCTTCTATTTTACCATAAAGTCCAGCCTTTGAAGAACTTTTA
CTAGAAGACAAGGGGCTTCTGTCTCTATTTGCCATCTTGGGCATCAAAAAAGAGGGGTCA
TCCCTCTTTACGAATTCATGCTACTAGGGTATCCAAATACTGGTGTGTTGATGACTGCCA
AAATATAGGTATCTGCTTTCAAGAGGTCATCTGGTCCAAATTCACATCCAAATGGGGAAT
TTTCTGCTCTCGGAAACCCAAAATATTCAGATTGTATTTGCCACGGAGGTCTAATTTAC
TCAGACTTTGACCTGCCCAAGACTGAGGAATTTTCATCTCCACGATAGACACATTTTTAT

CCAACTGAAAGACATCAACACTATTATGGAAAAGAATGGTCTGTGCTAGAGACTGCCCCA
TTTCATACTCTGGCGAGATAACCGAGTCAGCTCCCATCTT

ORF Predictions:

ORF #	Start	End	Direction	Length
-----	-----	-----	-----	-----
6	480	740	R	87 aa

[SEQ ID NO:] 3864700-6 ORF translation from 480-740,
direction R
VDPRAYLKILETLQELESKGQEMDVFTNFVYEKEGQSRKKSMSYESVLPVRQIFGWDQV
GNFSKGQYIMMHS LIYRTDLLRASQF*

Blastp and/or MPSearch Result:

Description:
unknown

Assembly ID: 3864706
Assembly Length: 1306bp

[SEQ ID NO:] 3864706 Strep Assembly -- Assembly
id#3864706
CTGATCGAATTTAAAAGAAGCCCACCCTAATCTGCCTACTTCTTACCTCCAACACTTGGT
CGTGTCCAACCTTTATCGAGACATTGACCTGGTGGCTCAAAAAAGGTCAAGATTTACAGA
CCAGGAAGTTGTCCAATTTTATCTAGACCTTCTCATTCTTAAAAATTGAATATAGAGTAA
AGCTTCAGTTGTCTTATTTCTAGGTTACTGAGTTTTTTATCTTTTCAACAACAAAAGAGG
ACCCGCCGATCCTCTTTTTTCATACTATAAATCCTTGATTATCAACTATATCTGTTTTAAT
CGAAATCTCAAAACAGCACTTTCAAACATCTTTTCCTAGTTAAGTAAATCAGTATTTTGC
TTAGCTGCCTTGCTCCATTGATACCAACCAACTAGACTGTTAATGAGATAAATTAGATAT
TTCCCTTGAATTTGCAGGCTTTCTCCCCACCAGAGATAGATTGAAAAGACATTGGTAGCC
GCCCAGAATATCCACTGTTTCACGGTAAACAGCTGTCATGAGGATTTGCCCTACCCCATG
GTTGCATCTGTGATTGAATCACGATAGGGGACGATTGGCACCAATAGACTGATAAATGAA
GCCAAAGGCCAACCACCAAGCACACTAATGGAAAGATACTTTGTCCAGCCCTTGCCGTC
CAGTTTACGCGGACAAACTCCTGCTTTTCTTTCTTAAACTGTGCCTGATAAATCCAAA

CTAGAGTCCAATTGGCTGCATGACTGTGAAGTAAAGTGTGTCAGCACCTCACCATAAAA
 GCCTTTCTGTAGGGCCAAATAAGGTAATAACAGAGTTAATCAAGCCAAAAAGATAATTAC
 TTGCTCGACCTTCCGATACAAGATTACACAGATAATCCCTGTCAAGCTACAAATCATCCC
 AATCCAGTCAACAATACGATGTTTCGTAAACCAACTCCAGCCAGAGAGGAAAACCTCCTAA
 AACCAGCAAATAAATCCACTGGGCAAACTACGATGGGCAAAGAGGTCATCCCAGATAGC
 CTTCATAGTTCCTGAAAATCCTAAATCAGCCATAGCCGCAACCATACGACGGTAACCACC
 TGACATTTTCACCTAGGGTTGTTTTGATATTTTCAATTTTCTTTTGCAAATAAGTATGCAT
 CATTTCTCCTTTTGTTTTTTAAAGAGCCGTGTCTGGATAGACTTTCGGACGCAACGCTCTA
 TTAGATAATGAACTGCCCTATACACAAGATTTCTAACCTTAGTCGACATGAGCTGAAACCT
 CTTATTTGTTAAGTAGTTCACNAAATATTATACACCTATTTTATGA

ORF Predictions:

ORF #	Start	End	Direction	Length
6	336	626	R	97 aa

[SEQ ID NO:] 3864706-6 ORF translation from 336-626,
 direction R
 VCFGGWPLASFISLLVPIVPYRDSITDATNGVGQILMTAVYREQWIFWAATNVFSIYLWW
 GESLQIQGKYLIYLINSLVGWYQWSKAQNTDLLN*

Blastp and/or MPSearch Result:

Description:
 unknown

Assembly ID: 3864710
 Assembly Length: 1676bp

[SEQ ID NO:] 3864710 Strep Assembly -- Assembly
 id#3864710
 AAACACGCTTGGCATGGCAGATAAAGCGAGATTTTTTGTTTTTTCTTGGACTTGGCGTCT
 TCTTTAATTGTCCATAAATCCATGATTTAATTGTACTAAAAATAATATAAAGTGCTAGT
 TTTTACGAATAAAGAAGTATGAAAGTAAATTTAGATTATCTCGGTCGTTTATTTACTGAG
 AATGAATTAACAGAAGAAGAACGTCAGTTGGCGGAGAACTTCCAGCAATGAGAAAGGAG

AAGGGGAAACTTTTTCTGTCAACGTTGTAATAGTACTATTCTAGAAGAATGGTATTTGCCC
 ATCGGTGCTTACTATTGTGCGAGAGTGCTTGCTGATGAAGCGAGTCAGAAGTGATCAAAC
 TTATACTATTTTCCGCAGGAGGATTTTCCGAAGCAAGATGTTCTCAAATGGCGCAGCCAA
 TTAACCTCTTTTCAAGAGAAGGTGTCAGAGGGACTGCTTCAAGCAGTAGACAAGCAAAAC
 CCAACCTTAGTTTCATGCGGTAACAGGAGCTGGAAAGACAGAAATGATTTATCAAGTAGTG
 GCTAAAGTGATCAATGCGGGTGGTGCAGTGTGTTTGGCTAGTCCCTCGCATAGATGTTTGT
 TTGGAGCTGTACAAGCGCCTGCAACAGGATTTTTCTTGCGGGATAGCTTTGCTACATGGA
 GAATCGGAACCTTATTTTCAACACCACTAGTTGTTGCAACAACCCATCAGTTATTGAAG
 TTTTATCAAGCTTTTGATTTGCTGATAGTGGATGAAGTAGATGCTTTTCCTTATGTTGAT
 AATCCACGCTTTACCACGCTGTCAAGAATAGTGTAAGGAGAATGGATTGAGAATCTTT
 TTAACAGCGACTTCGACCAATGAGTTAGATAAAAAGGTCCGTTTAGGAGAACTAAAAAGA
 CTGAGTTTACCGAGACGGTTTCCATGGAAATCCGTTGATTATTCCAAAACCAATTTGGTT
 ATCGGATTTTAAATCGCTACTTAGACAAGAATCGTTTGTCAACAAAGTTAAAGTCCTATAT
 TGAGAAGCAGAGAAAGACAGCTTATCCGTTACTCATTTTTTGCTTCAGAAATTAAGAAAGG
 GGAGCAGTTAGAAGAAATCTTACAGGAGCAATTTCCAAATGAGAAAATTGGCTTTGTATC
 TTCTGTAACAGAGGATCGATTAGAGCAAGTACAAGCTTTTCGAGATGGAGAAGTACAAAT
 ACTTATCAGTACGACAATCTTGGAGCGTGGAGTTACCTTCCCTTGTGTGGATGTTTTCGT
 AGTAGAGGCCAATCATCGTTTGTTTACCAAGTCTAGTTTGATTGAGTTGGTGGACGAGT
 TGGACGAAGCATGGATAGACCGACAGGAGATTTGCTTTTCTTCCATGATGGGTAAATGC
 TTCAATCAAGAAGGCGATTAAGGAAATTCAGATGATGAATAAGGAGGCTGGTCTATGAAG
 TGCTTGTTATGTGGGCAGACTATGAAGACTGTTTTAACTTTTAGTAGTCTCTTACTTCTG
 AGGAATGATGACTCTTGTCCTTGTTCAGACTGTGATTCTACTTTTGAAAGAATTGGGGAA
 GAGAACTGTCCAAATTGTATGAAAACAGAGTTGTCAACAAAGTGTCAAGATTGTCAACTT
 TGGTGTAAGAAGGAGTTGAAGTCAGTCATAGAGCGATTTTTACTTACAATCAAGA

ORF Predictions:

ORF #	Start	End	Direction	Length
6	442	972	F	177 aa
7	1247	1438	F	64 aa

[SEQ ID NO:] 3864710-6 ORF translation from 442-972,
direction F

VSEGLLQAVDKQNPTLVHAVTGAGKTEMIYQVVAKVINAGGAVCLASPRIDVLCLELYKRL
 QQDFSCGIALHGESEPYFRTPLVVATTHQLLKIFYQAFDLLIVDEVDAFPYVDNPTLYHA
 VKNSVKENGLRIFLTATSTNELDKKVRLLGELKRLSLPRRFPWKSVDYSKTNLVIGF*

Blastp and/or MPSearch Result:

Description:

COMF OPERON PROTEIN 1. - BACILLUS SUBTILIS.

[SEQ ID NO:] 3864710-7 ORF translation from 1247-1438,
direction F
VDVVFVEANHRLFTKSSLIQIGGRVGRSMDRPTGDLLFFHDGLNASIKKAIKEIQMMNKE
AGL*

Blastp and/or MPSearch Result:

Description:

COMF OPERON PROTEIN 1. - BACILLUS SUBTILIS.

Assembly ID: 3864724

Assembly Length: 2159bp

[SEQ ID NO:] 3864724 Strep Assembly -- Assembly
id#3864724

CTGCTCTCACCATGCGATACGAACAGCATAGGTTTCAACTTTATCAAAGCTAAAGTGGTT
CAATTCTCCACCCTTGAGTTGAGCAGGGGGCTTTTATAGATTAGTAACTTGGTTTCCCAG
TTGGCAGAATCATTAAGACATGGTCCTTATTACCAACAAAAGCTAGGGTTTATAGGAGC
TGTGGGACAGTCTTACCAACATAATACTCAATCACATAAGACTTCGGTGCACCAACTCC
ATGGTCTTCATGGAAGCCAACGCTTAAGTTATCAACTGAACGTTTGCTCAAAATACCTGA
ATCTCCGAATAGGACACCGACTGAAGCTTCTGGATTACTACGATTCCAGTTTGTCCAACG
ATTGGCTGGTTGGTTATTGTAGGAAATGAGCTTGTTCATTAACTTTGAAACTGGGTCGCT
TGGATTGAATCTGAAGCAAAGGCAAGTGGCAATTCTGAACCGGTCCATTGGTCAGAAAT
GTTTGACCTTGCTCAGTTTGAGCAGATACGCGAACATGAAGTTTAGTTGTTAATTGAGT
ACCTTCTAAGCGACCATTAACTGTAAAGACACCTTCCTTAGCGTATTGCTCTGGACGAAT
CGCATCCCATGCAACCTTAGCTGATGAAACGTGACCATTGAATCATATGTCCGAACACT
TTCTGGTAATTGTGGTGCTTCTGCGATTGGAGTTGTCACACTGACTTCTTCAACTGAAAC
GATACCTTCTACAGAGACTTTTGCACGCGCTTCAAGGTCAATTCCTTCAACTTTACCTAG
TACTTCAAATGTCTGATAGGAGTCTAGTTTTTCTTTTCGGAATAGCTTGCCAAGTGACTTT
ATGAGTTTTAGGGAAACCTTTGTCATACTCAACTGTTACTGTTGCTGGAAGACTTGGTTC
CTGATGCAAATCTGTCACTACATTTACAGGACGGATGGATTGCGCAATCTTCTTCTCAGT
ATTGGCTTGGATAGTGAGTTCAACTTGGCCTTTAGCTCCCTCATATTCAGCGTTCAAAGT
GACTGCTCCTGGCTTATGCAACTCAAGCATTCCTTTACGAATTGCGACTTCCCCCTTACC
ACTGTAGAGAAGGTTACTTTATCAGCTGGTAATACAGCTTTCGTTCCATCTTGATAGTG

AGCTCGAACCGACAATTTGACAGTTTGGTCTTCTTTGAGACTGTCAGCTTTTCCACTTG
 CAAGCTCAAGTGAGCAATTTTGGCGCTTCTTCAAGGAATTGAATTGCATAGGTTGAAGA
 GGGCCACCATCTTTAGGCTGAATAAAGATGCTCGCACGCATGCCGTTTGCTGCGCTTGCT
 TGAAGAACTGTAACAGCTGCATTTTACGACTTGCTGTGACTTCTGGCAACTTAGCTCCA
 TAAGCAAGAGTGCGGTATTGCATTGGTFTTTGACTAGTAAGACCTGTGACAGCTTCACCA
 CCAACCGTTACAGTTGGTACTGCAGGTGCCGCAGGATTGCCTTCTTCTACCACAAGGGTT
 GCATGAATTGGTTGACCTTCTAAATAACCGGTCGCTTGAATACGAGAACCTGGAATTGCT
 AACTTAGCTTTATCTTCTTCGGCAATCTCCCACTTGTCCACTTCATACTCTTCAACACTT
 CCATCAGTCAAAACATAGGAAACAGATTTGTCTACAGAATTCAAGTCAGTATTTGGAGCA
 ATACGTTTCACAACTGGTAGCTCTGATTTAAGAGCAATCACTTCTACACGAGCTTCTACT
 TCTCGTCCGTCAGCCATACCTTTCACCGTTACAATACCAGGCTTGCTCACATCTACTGAA
 GACCAGGTTACAGGACGTTCTGCACGGCTACCATCACTGTATACAAACGGAACAGTGGTA
 GGCATTTACAGGTGCCTCTCCAATAATGGTCTGTACTTTTGGCACTTCTGTCCCCAAAACA
 GTCTTCTCTTGTCTTCTTTCTTACCAGTAAAGACAGTGACTTGGTTTCGATTTCAAGAGA
 TCAGAGTGGGCAGTAAGGGTGAATTTCCCTGCTTGTTTCAGTTGATTTGACAATGGCAACA
 CCTTTACCATTAAATGCTTTACGAATCCAAGAACCATCTGCTTGCGCCTTATAGCGTTCA
 CGACTGGCTTGTTCTCCGTTATCTACACCGACCAGTTGACCTTGGCCATGCAATTCGAT

ORF Predictions:

ORF #	Start	End	Direction	Length
6	133	1197	R	355 aa

[SEQ ID NO:] 3864724-6 ORF translation from 133-1197,
 direction R
 VEKADSLKEDQTVKLSVRAHYQDGTQAVLPADKVTFSTSGEGEVAIRKGMLELHKPGAVT
 LNAEYEGAKGQVELTIQANTEKKIAQSIRPVNVVTDLHQEPSLPATVTVEYDKGFPKTHK
 VTWQAIPKEKLDSYQTFEVLGKVEGIDLEAKVSVEGIVSVEEVSVTTPIAEAPQLPES
 VRTYDSNGHVSSAKVAWDAIRPEQYAKEGVFTVNGRLEGTQLTTKLHVRVSAQTEQGANI
 SDQWTGSELPLAFASDSNPSDPVSNVNDKLISYNNQPANRWTNWNRNPEASVGVLFGDS
 GILSKRSVDNLSVGFHEDHGVGAPKSYVIEYYVGKTVPTAPKNPSFVGNEGPCPCL*

Blastp and/or MPSearch Result:

Description:
 unknown

Assembly ID: 3864734
Assembly Length: 2199bp

[SEQ ID NO:] 3864734 Strep Assembly -- Assembly
id#3864734

CTTATCGTACTAAGGATGGCAGTGTTCAACTGTTCCGTCCTGATGAAAATGCTAAACGCC
TGCAACGTACATGTGACCGTCTCTTGATGCCAACAAGTTCCGAACAGACATGTTTGTAGA
AGCTTGTAAGCAGTTGTCCGTGCGAATGAAGAAACGTACCACCATACGGAATAGGTGG
AACTTTATATCTTCGCCCTCTTTTGATTGGTGTCTGGAGATATTATCGGGGTAAACCGGC
AGAAGAGTACATTTTACCATCTTTGCTATGCCAGTTGGAAATTACTTTAAAGGTGGTTT
GGTCCCAACCAACTTCTTGATTTCAGGATGAGTACGACCGTGCAGCACCAAATGGTACAGG
TGCGGCTAAGGTTGGTGGAACTATGCTGCAAGTCTCTTACCAGGAAAAATGGCCAAGTC
ACGCCATTTCTCAGATGTTATCTATCTGGACCCATCAACTCATACAAAGATTGAAGAAGT
CGGATCAGCTAATTTCTTTGGAATTACAGCTGATAATGAATTTGTAACACCATTGAGTCC
ATCTATCTTGCCATCTATTACCAAGTATTCCCTTGCTTTATTTGGCAGAACATCGCTTGGG
ATTAACCTCTATTGAGGGTGATGTTCCAATTGATAATCTTGACCGTTTTGTAGAGGCAGG
TGCTGTGGTACAGCAGCGGTTATTTCTCCAATTGGAGGTATTCAACATGGTGATGATTT
CCATGTATTCTATAGTGAAACAGAAGTAGGTCTGTGACGCGTAAATTATATAATGAATT
GACGGGTATTGAGTTTGGCGATATTGAAGCGCCAGAAGGTTGGATTGTAAAAGTAGATTA
AAATAAACCAAAGGAGATTTTTTATGAAATAGAAAAAGTGGCTCTTAACAGCAGGAGTGG
TCCTGAGCACGTGAGCTATTTTAGTGGCTTGTGGAAAACTGATAAAGAACCAGATGCAC
CGACAACATTTCTTATGTCTATGCAGTAGATCCAGCATCATTTGGGCTACAGTATACCGA
CTCGAACATCGAGGACAGACGTTATTGGAAATGTTATTGATGGTTTGATGGAAATGATA
AATACGGCAATGTTGCTCCTTCTCAAAAAGACTATGATTTGAACAGTACAGGATGGGCTC
CAAGCTATCAAGATCCAGCGTCTTACTTGAATATTATGGATCCAAAATCTGGTCTGCCA
TGAAACACCTTGGCATTACGAAAGGAAAAGATAAGGATGTTGTAGCTAAACCTGGTTTGG
ATAAATATAAGAAATTGTTAGAAGATGCTGTTTCTGAGACCACTGACCTAGAGAAGAGAT
ATGAAAAATATGCCAAAGCTCAAGCTTGGTCGACAGATACTTCATTATTGATGCCAACAG
CTTCATCTGGTGGTCTCCAGTTGTAAGTAACGTACTACCATTTCTCAAAACCATACTCAC
AAGTTGGTATTAAAGGGGAACCATATATCTTTAAAGGAATGAAATTGCAAAAAGATATTG
TTACAACAAAAGAATATAACGAGGTTTTTAAAAAATGGCAAAAAGAAAAATTGGAATCCA
ATAGCAAATACCAAAAAGAACTAGAAAAATCCATTAAATAAGGAATGGTATTGATCTTGA
TAAAAATTTTCAAAATACTGTCATTTTGAATATAAAGGAGTTTGATATGGAGTGGATTACA
TTAATAGGAATAGCAATCATTTGTTGTGGGTCTTATTTACAAAATTTGATACAATTGCAAC
AGTAGTCTTAGCTGGTTTGGTTACAGCTTTAGTTTCAGGTGTTTCTCTCGTTGAATTTTT
GGAGATTTTGGGAAAAGAATTTAGCAATCAGCGAGTGCTCACGATTTTTATGGTTACCTT
GCCTCTTGTGGGGCTGTCAGAAACCTTTGGACTCAAGCAACGATCAATCGATTTGATTCTG
AAAGATTAAAGGTCTGACAGTTGGAACTTCTATACAGTTTATTTCTTTATTCGAGAGTT
AGCTGGTTTCTTTTCAATTCGCTCTAGGAGGACACCCCTCAGTTTGTCTAGACCTTTGGTTCA
ACCTATGGGAGAAAGCAGCTGCAGAGTCTCAATTAGGTAGAAAGTTAACAGAGGTTGAAGA
TGAGACAATAAAAAGCGGTGCGGCTGCGAATGAAAATTTTGGAAATTTCTTTGCTCAAAA

TACGTTTGTAGGTGCTGGGGGAGTCCTCTTGATAGGGG

ORF Predictions:

ORF #	Start	End	Direction	Length
7	897	1601	F	235 aa

[SEQ ID NO:] 3864734-7 ORF translation from 897-1601, direction F
VVLSTSAILVACGKTDKEPDAPTTFPYVYAVDPASLGYSIPTRTSRTDVIGNVIDGLMEN
DKYGNVAPSQKDYDLNSTGWAPSYQDPASYLNIMDPKSGSAMKHLGITKGKDKDVVAKPG
LDKYKKLLEDAVSETTDLEKRYEKYAKAQAWSTDTSLLMPTASSGGSPVVSNNLPPFSKPY
SQVGIKGEPYIFKGMKLQKDIVTTKEYNEVFKKWQKEKLESNSKYQKELEKSIK*

Blastp and/or MPSearch Result:

Description:

aliB protein - Streptococcus pneumoniae (oligopeptide binding protein)

Assembly ID: 3864740

Assembly Length: 1118bp

[SEQ ID NO:] 3864740 Strep Assembly -- Assembly id#3864740
CTCCTATTGGTATTTTGCAGAAAATTTTCTCCATCAATCCAGTCTGGATAAAGACCAATAG
TCCAAACCCAAAAAGTAGGAAGACTGAGCCACCTAAGAGTAGACTGAAGGCGGACAGATA
AAGAACCATCACAATGAGGACAAGAATGGCTAACATGAGGAAGAACCAAGGAAAGTTAAA
ACTAGCCAACATCAATCCTTTTTGAAGAATTTCTTTCCAAGATAGGTCATAACGTGCCGC
GATAGGGTAACTAGCCAGCATCACGATAGTAAGAAAAATCAGAAATACCTAAACAAATGGC
TTTCAGCAATTGGAAGGGCAGAGCTGTTTGACCCAGAAAAGATAGAGATCTGAAAGGGT
AAGAAACACAATTCTTAACCTCATTAAACCCAGCTGAAGACCTAGTTTCAGATTTTGCTT
GAAAGATCTTAGATAGATTTTAAAAACAGGCACCCGTCTGCTCTTCTTAACCTTCGAACAT
GGTCTCGTAGAGGCTGATTTTAGCCACTCCAATCGTCACGATGGGTAAACAAGAGACGAC
AAAAAGAAGATTGGCTGTCACGATGTCCAAGACCTTCTCACTAAAACGCATGAGAAAGTT

ATCTGTATCAAATGCTGCCTTGATAAGGCTTACTCCTTTTTGTGCCATGTTTGCTCCTCC
 ATCATTTTTCTTTGTAACTGTTTCTTTTTTGTTCAGTAAAGCTTTCATAAGTCCCTACC
 ATGAACAAATCTATTTTTCTTTTTCTTTTGGACTTTTTCTATTTTTATCTATGGATAT
 ATAATGTATATATAGCGAGGACAACGCACTAGCTAAAATATTACGCCAAGTGTGTTTCATC
 AAATCCATTTATTCTCCACGGATTATCATTTGCAAGCACTGTCCAAGCTAACATATACAA
 TAAAAAATACAAAGTGCTTTTCATTCTCGCATTTTAAAAGTTTATACGACCATTGTTAGGG
 ATTTTATCATGTGCATCCCAAGCTGCAGCAATATTGTAGGCAAAATTACCATATACATCA
 GCTACATTCACAGCTATTTGTAAAAATCCTTCCAGAAATCTTGGTCAGTAATCCTACTCTT
 GCTGCTGCAGTTGCAGCTGCCCTACTTAAGATCGATCG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	4	264	R	87 aa

[SEQ ID NO:] 3864740-6 ORF translation from 4-264,
 direction R
 VMLASYPIAARYDLWKEILQKGLMLASFNFPWFFLMLAILVLIVMVLVLSAFSLLLGGG
 VFLLFGFGLLVFIQTGLMEKIFAKYQ*

Blastp and/or MPSearch Result:

Description:
 unknown

Assembly ID: 3864792
 Assembly Length: 1431bp

[SEQ ID NO:] 3864792 Strep Assembly -- Assembly
 id#3864792
 TCCAAATAAGGAAAATAACACTTCTCAAGAAAAACACAACAAGAAGAAACGCCAAAATC
 TAGCGTCAAGGAAGAGAAAAAAAATCAGAAAACCAGCAACTTCAGGACTCTAATAACA
 CCTGCTACAAGTAAACCTGCCACTGAAAATGAAAAACAGCCCAATACTCCAATTTTCAGAA
 AATAATACTCAATGAAAATCAAAGAGCAAAGTAGGAAGCTAGCCGTAGGCAGTACTTGGAG
 TACGGCAAGGCAAAGCTGACGTGGTTTGAAGAGATTTGCGAAGAGTATAAAAGTAATCAA

TAGCCAGTAAAATAGCTCCTTCCAACCTTGGAAAGAAGCTATTTTTTATTGCTGCAATAC
 TTTTCTTGGCTTGGTACCTTCAGCTGGACCAATGACACCTGCCATCTCAAGCTCTTCCAT
 GAGACGGGTGCGACGGTTAAATCCAACCTGACAAACGACGCTGAATCATGGATGCACTGGC
 TTTCTGTGTTTCGATAACCAAAGACTTAGCTTCTTCAAAAAGCGGATCACCACCAGCATC
 TCCATCCGAAAATTCTCCTTCATTTTCAGAAACCTCACCTGGATCAAAACTCTCATCGTA
 GTCTGCATCTGCCTGAGTCTTGATGAAGTTCACAATGCGCTCAACATCGTCATCCGAGAT
 AAAGGAGCCTTGGAGACGAACCTGGATGATTTTCATTAATCGGTTTAAAGAGCATGTCTCC
 TCGACCAAGAAGTTTTTCTGCTCCATTTTCATCCAAAATCGTACGGGAGTCTGTTTCCTGA
 TGAAACCGCAAATGCTACACGAGATGGAACATTGGCCTTAATCAAACCAGAGATGACATC
 AACAGATGGACGCTGAGTTGCAAGAATCATGTGGATACCTGCAGCACGCGCCTTCTGCCC
 AAGACGGATGATAGCATCTTCCACTTCCCTTGCTGGCCACCATCATGAGGTCAGCCAACTC
 ATCCACAATCACGACAATGAATGGTAGCGGAATTTGCTTGTACTCAGACTGGGAATCGAA
 CTCGTCTACCTTGGCATTAAAACCTGCAACAGCCCCGAACCTCCACCTTGGCAAAGAGTTC
 ATAACGGTTTGCCATTTTCATCCACAACCTTTTGCACAGCCCTGCTGGCTTTGCGTGGATT
 GGTCAACCACTGGCAATCTAACAGGTGGGGAATATCACTGTAGAACAGATAACTCAACCAT
 CTTTGGGATCGACCACCCATCCTCAGTAAATTTAACTTGATCTGGTCTCGCCTTCATGAG
 AATGCTANCAATAATGCCGTAACTGCTACTGACTTCCCTGAACCCGTTGAACCTGCAAC
 TAGCAAGTGGGGCATTTTAAAAAGGTCAAAGCTCTTGCGGTTCCATTAACAGCCTTCCC
 TAAAGGAATTTCCAAGAAATTTTCTGCTTCGTTTGCATTGTTCCATAGTT

ORF Predictions:

ORF #	Start	End	Direction	Length
6	346	1149	R	268 aa

[SEQ ID NO:] 3864792-6 ORF translation from 346-1149,
 direction R

VVTNPRKASRAVQKVVDDEMANRYELFAKVGVRVAVAGFNAKVDEFDSQSEYKQIPLPFIV
 IVDELADLMMVASKEVEDAIIRLGQKARAAGIHMILATQRPSVDVISGLIKANVPSRVAF
 AVSSGTDSTILDENGAEKLLGRGDMFLFKPINENHPVRLQGSFISDDDVERIVNFIKTQA
 DADYDESFDPGEVSENEGEFSGDAGGDPLFEEAKSLVIETQKASASMIQRRLSVGFNRA
 TRLMEELEMAVGIGPAEGTKPRKVLQQ*

Blastp and/or MPSearch Result:

Description:

STAGE III SPORULATION PROTEIN E. - BACILLUS SUBTILIS.

Assembly ID: 3864830
Assembly Length: 1412bp

[SEQ ID NO:] 3864830 Strep Assembly -- Assembly
id#3864830

AGACAATCTGATCAATCCCGTGGGTCGGAACTCCAAAGTATGTGCTTTTATGTTCAAGG
GATACAGGGCTTGGTAAATCTTCCGTTTCGCGGTCAACCCCATTTTTAAGCCAGAGCTAG
CAGTCGGGTCATTTGATACAAATTCATAATTCTTCTCTTCATCTTGCCACTGCAGATAGT
AGGCCTCTTCCAGCGCCCTTCTTTTAATAAAGTCAGAATTTCTGTCTTTCGCGTCAAAA
GATTTTTTTGCACGTCTAAATTATTTTTAGCAAACCTGGTATTCCTCCGAGCTGGTATCAG
ACATTTGGGAGAGTTTCTCTTCATTTTCATTGATGACTCTCTCACGGTCTACAAGACGAG
TTTCCAACCTCTCTCTCCAAGCTGACTGAGTTTGCAGTCTGACTATTTAAATAAAAAGGTAA
CACCGAGTACAGATGCAAATAAAAAGTAAGATAATCCAGTTTAAACGACTTTTGAAAACCTT
TTTTCAATAAAAAATAGACTAACATCTTTCATAAACTAAACCTCTTCTATCTGCCCCGTAT
GAATGGTTACTACTCTATCGCAGATATCAACCAACTCTTCTTATAGTGGGAACCTTAAAA
GAACCAGCTGTTCTTGTCTATCGATTTGTGCTAGCCTATCAAAAACTTCTGTCTATAAT
ACTCGTCTAAGCCATTTGTAATCTCATCCATGAGCCAGCATTTGGCCTGACTGAGAAAAAT
ACATAGCAATCACCAAGCGTTGCTTCATCCCTAAGGAATACTTGCGGATGGGAAGACTGA
TATAGTCAGCCATTTCCCAGTAGGCGATTTTCATCTCTCAAGTTTAGGTCTGACTTCCAGA
TGTTTTTTTATGAGACGAAGGTAGTCCATCCCACTTAAGTTTCCATCCAGCCATTCACGC
TCTCATAATAAAACAAAGAAGGAGGAACCTGCGATGTGTCCACTACTAAGGGGAAGCAACT
TGCTCATAGCTCGGAATAGTGTGCTCTTTCCTGAGCCATTGATAGCAAGAAGGCCATAAA
TCCTACCCTTTTTTAAAGGTAAAATCCGCATCTTGCAAGATGACTTGTCGCGTTTTTAAGG
TAACATGAGTAAGATTTAACATATCCAGCCCTCCTTTTCTCACTCTTTAAGGATTAATAA
CCTCCAGTATAGTAGTTTATGACCTCATAACGAGCGTAGTTCCAGCCTCCGCCAACTTTA
TACTCAGAATAGCTGTAATAACGAGACCATTCCGGAATCCAAGCATACTGATGGTCGTGA
TAGTTGGTACTATATTCCAAAACCGTATTCCAATCATACTTGTAACCTTTTAGTGGCTGTC
ACAGCAGATACACTGGACTGAAGAATACCAATAGATTATAAACTAACTAATAAAACAACT
TTTGCTGATTTTTAATGATTTTATATCCTCAA

ORF Predictions:

ORF #	Start	End	Direction	Length
6	515	1123	R	203 aa
7	1134	1322	R	63 aa

[SEQ ID NO:] 3864830-6 ORF translation from 515-1123,
direction R
VRKGGDMLNLTHVTLKTRQVILQDADFTFKKGRIYGLLAINGSGKTTLFRAMSKLLPLS
SGHIAVPPSLFYYESVEWLDGNLSGMDYLRLIKNIWKSDDLNRDEIAYWEMADYISLPIR
KYSLGMKQRLVIAMYFLSQAKCWLMDIEITNGLDEYYRQKFFDRLAQIDRQEQVLVLLSSHY
KEELVDICDRVVTIHQGQIEEV*

Blastp and/or MPSearch Result:

Description:

ATP-BINDING PROTEIN BEXA. - HAEMOPHILUS INFLUENZAE.

[SEQ ID NO:] 3864830-7 ORF translation from 1134-1322,
direction R
VTATKSYKYDWNNTVLEYSTNYHDHQYAWIPEWSRYYSYSEYKVGCGWNYARYEVINYTG
GY*

Blastp and/or MPSearch Result:

Description:

unknown

Assembly ID: 3864848
Assembly Length: 1640bp

[SEQ ID NO:] 3864848 Strep Assembly -- Assembly
id#3864848
CTAACAAGGTCATGATACCAGCACTAGCCAAGGTAGCATTAGCTTCTGTACCTGTGTTTG
GCAATTCCTCTCTCTTACCTGTCTCATAAGTCGGAACCTCTGGGTCTGGATTCACTGGAG
TTTCAGTTTTTGGAGTACCTGGTCTGGAGTTGGTTTATCTGGTGTTGATAAACGGTCAT
ACCTTACCGTTATTTCTTTATCACTAGAGTCTGACGTAACCTCTTGTGATTCAACTGTTG
GAATATCTGGATCTTTGTACTTGTCAATCTTACCAGATATAACCTCGTCCCGAGTTTCCTG
TTGTCCATTACCGTAGGTTACAACCTCCCGTGACCTTGTTCTCAGTTTTTGTACGGCTTA
AGGTTACAGGTTGAACAACATCTTCTTTTACATTTTGGTTCGTAACCTTTATCAACGTAAT
GAATGATACGCGTTATAGTCTTCGTCTCAGTAGAGGTTGCTGTTTTGGGAACCACTGTTT
CCTCAACATTCTCACGGTAGTAATAGTCAACTGTTGCACCGTCTTCTGGTACGCATTTGC

AGGAGTTGCTACCAAGGTGTATGTTGTTTTCCCTTGATGATAACTCGGTCTTCTTTGTCCTC
 AGTTGTTGTTTTCCCTTCAATAGTTTTTGATTCTGTGGTATACTCAGAACCTATCGCTAA
 ATCAGCTTTTATAACAGACTCTGCCAACTTCTCTTGCTACCTTCTTTATAGTAATTCGA
 TGTTACTGTAGCAGTGGTTGGCGCTTCGCTTTACTCTATAAACTAAGGTCAGTGTCTAC
 CTTTCGCTTACAATATTCCCAGTTAAACTTGCAGAATTTGTATCTGCTTCTTTAAAAGTAT
 AATATTTTCCGTCAGTAGTAGTCATGCTACTGAGTTTTTTATCTGTGACATAATAGCTGG
 TACCAATCAGTTGTTTTTTATTGGTAATGTAGGTTCCGTCAGTCTTCTTTTCTCCAATTC
 CAGTATCATTTTTTCAATGATAGCAAACGCCCTTGTTTCATCAACATAGCGAACTTTCACAT
 TTTCTGAGATTAGTTCTGCCAATTCAGAGTTTTTTTCTTTTCTTGATTCTTCGGTTA
 TTTTCCCTTTCTCTTCTTCGGGAATATTTAGTTTTTGAATGATTTTTTCAACAACGGTTC
 GTGATGGTTCCACAGTATCTTGATGACTGAAAAGTCAGCTAGAATTGGGAGATTATAAT
 GAACACGGTGACTTTGAGTGTCTTACTCCTACTCTTTCATTATTCTCTGAAAATACTCGTA
 CGGTATAAGAAACAACATCTTTTCCTAATAGAACATCCCCAGTAGAGAAATAGCCGCCTT
 TTCCTAGTTTGCTATCTCCAGAGTCCACTTCTTTCCTAATCTTATCAGATAGTTTTTTAC
 CAGTCAGTACATTCGTTTCGCACAATCCCTTTGTCTACCCCTACAAAGTGGGAGAACTTTT
 TGAAGTCTTCAGAACCAGATCTAGCCCAACCATTATTAAGGGCATTTGCTTTTGTATTTG
 TATTCTCTCTCAAAGGTTTGGCGATTAGAATTATATTCATCGGCACTTAGAGTTGCTGCT
 ATATCTGACTCTTGAATACCAACTTCCTTACTACCATTCTAGCGGCAGTATATGTGAAT
 TAATCTGTTTATACTTCTAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	707	1546	R	280 aa

[SEQ ID NO:] 3864848-6 ORF translation from 707-1546,
 direction R

VPMNIIILIAKPLRENTNTKANALNNGWARGSGSEEFKKFSHFVGVVDKGIVRTNVLTGKKLS
 DKIRKEVDSGDSKLGKGGYFSTGDVLLGKDVVSYTVRVFSENNERVGVNTQSHRVHYNLP
 ILADFSVIQDTEPSRTVVEKIIIPKLNIPEEEKGKITEEIKKKKKTSSELAEISENVKVR
 YVDEQGRLLSLKNDTGIGEKESDGYITNKKQLIGTSYYVTDKKLSSMTTDDGKYTFKE
 ADTNSASLTGNIVSEGRVTTLVYRVKRSANHCYSNIELL*

Blastp and/or MPSearch Result:

Description:

MURAMIDASE-RELEASED PROTEIN PRECURSOR (136 KD SURFACE
 PROTEIN). - STREPTOCOCCUS SUIS.

Assembly ID: 3864878
 Assembly Length: 861bp

[SEQ ID NO:] 3864878 Strep Assembly -- Assembly
 id#3864878

CTGGGGGAACTCAAATTGTTAATGTTATCATCAAGGGCGGATGTAACAAGGTTATGTNGG
 AAGCCTTCTGCCTCAACTTCAAAAAGATTGAACGTGGAAGGTGTCAAAGTGACTATCGT
 CCACTCAGCGGTCGGTGCTATCAACGAATCAGATGTGACCCTTGCCGAAGCTTCAAATGC
 CTTTATCGTTGGTTTCAACGTACGCCCTACACCACAAGCTCGTCAACAAGCAGAAGCTGA
 CGATGTGGAAATCCGTCCTTCACAGCATTATCTACAAGGTTATCGAAGAGATGGAAGAAGC
 TATGAAAGGGATGCTTGATCCAGAATTTGAAGAAAAAGTTATTGGTGAAGCGGTTATCCG
 TGAAACCTTCAAGGTGTCTAAAGTCGGAAGTATCGGTGGATTTATGGTTATCAACGGTAA
 GGTGCCCCGTGACTCTAAAGTCCGTGTTATCCGTGATGGTGTCTGTTATCTATGATGGCGA
 ACTCGCAAGCTTGAAACACTACAAAGATGACGTGAAAGAAGTGACAAACGGTCGTGAAGG
 TGGATTGATGATCGACGGCTACAATGATATTAAGATGGATGATGTGATTGAGGCGTATGT
 CATGGAAGAAATCAAGAGATAAGATTTTTTGTCTCCTTTCTTAGGTGGTGAGGGACGCAAG
 CAAACCGATGGTTTCATTGCTTATTTTTGAGCCTAGGGTCTCAAAAATCCCCGTGATGG
 GACTGATAAATCAGTTCCATCACTTTACCACGGCGAAAGAAGCAGATGACTTCAAATTG
 AACTTCGTTTCAATTTAAACTGAAAATCAAGAAGTTTAAAATAGCTAGGTCTGCTGGCCT
 AGCTTTTGGTTCAAAGTAGAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	95	622	F	176 aa

[SEQ ID NO:] 3864878-6 ORF translation from 95-622,
 direction F

VEGVKVTIVHSAVGAINESDVTLAEASNAFIVGFNVRPTPQARQQAEADDVEIRLHSIIY
 KVIEEMEEAMKMLDPEFEEKVIGEAVIRETFKVSXVGTIGGFVINGKVARDSKVRVIR
 DGVVIYDGEASLKHVKDDVKEVTNGREGGLMIDGYNDIKMDDVIEAYVMEEIKR*

Blastp and/or MPSearch Result:

Description:

INITIATION FACTOR IF-2. - ENTEROCOCCUS FAECIUM
(STREPTOCOCCUS FAECIUM).

Assembly ID: 3864950
Assembly Length: 1469bp

[SEQ ID NO:] 3864950 Strep Assembly -- Assembly
id#3864950

ACTCTTCAAGGAATAATTGCATATGTTTGAAGACAAATCTCAAACAACCTTAGTCCTTTT
ATTATACTGTAAGAAGATATAGTTTTCAATTATAGTTTTTCTCTAACTAGTTATAGTCTA
TTTTTATATCCTAGTGTAAGAAAACAGCCCTAGGGACTGTTTTTCATTAATAATGCATAA
GAACTTTGTAGTCGTAGTCACCAATTTTTTTCACGGCCGTTCAATTCATCCAATTCAACA
AGGAAGGCACAACCTGCCATAACACCACCAAGTTTTTCAATCATCTCGATAGTTGCCTTA
ACAGTTCCACCTGTCGCCAAAAGGTCATCTACAATAAGAACACGTTGACCTGGCTTAATG
GCATCCGGCGTGCATAGTTCAAGGTATTCGACACCGTACTCTTTTTTCATAGTCAGCAGAA
ATAACTTCGCGTGGCAATTTACCTGGCTTACGAACAGGCGCAAAACCAATCCCAACTCA
AAGGCAACTGGACAACCCACGATAAATCCACGAGCTTCAGGGGGGGTCCCACGGGGGGAT
CATGCCGACTTTCTGGTCAGTAGCATACGTGAACGATCCCACGGGGGAACAGGAATTCTGT
AGCTATAAGCATTTCATCAGCCATCAAAGGACTAATATCACGGAAGGTAATGCC'TTCCT
TTGGATAATTTTCAATTGTTGCAATGTAATCTTTTAAATTCATCTTTTTCTTTCTTTCAA
AGTTTTTTTACTCTCTATTATAGCATATTTTTTAAAGAAAGAAAAAGGAAAAGTTAAGTTT
AATAATTATCTAACGTTTTGACGATTTATAACTAGCCATCGCAATAAAGCCCAATTTCTG
TTTATTCTTAGCAAACATTTTATACATAGTTAAAACTGCTTTCTATTCTCCTTTTTTACA
AGCATTTACACAAATTTTCAAAGTTCCCTAGCAAACCTTCGTCATAAATCATACCCGATAA
TTTCATTAATGTCATTTACACAGTCAATGCTTTTACATCACAATAACCTGATTCTATCAT
CACCTGTTCCCAACCATCTTGAGTTAAAGGACCTACATTTACATGAATTGCTTGTGATAA
TTCTGTCTGATAGACTCTTTAGCTTCCTTAAGAAGCACATCATGTGTCAAGAGAAGACC
TCCAGGTTTTAATACCCTTAGATATTCCATTACACATTTTTTCTTAGCTTGATCGGCTTG
CATAGTCAGCATAGCTTCATTTATAACAATATCAAACTAGCATCTTGATAAGGAAGTTT
CATTGCATTTGCTCTTTCAAACCTGATTAAATGAGCAACACCTGCCGTTCCAGCAGATTT
TTTAGCCACTTCTAAAGCTTGAGCATCCATATCAACAGCAGTTATCTTGCAACCAAAACG
CTGTGCCAACTCAATTGCTGTAGTTCCCTATTACACGCAACCTCTAGTATTCTCTTTTC
TTTTGGAAATCCTCCTTCTGCAATTCGAT

ORF Predictions:

ORF #	Start	End	Direction	Length
-----	-----	-----	-----	-----
				145

6 198 500 R 101 aa

[SEQ ID NO:] 3864950-6 ORF translation from 198-500,
direction R
VGCPVAFELGIGFAPVRKPGKLPREVISADYEKEYGVEYLELCTPDAIKPGQRVLLIVDDL
LATGGTVKATIEKLGGMAGCAFLVELDELNGREKNW*

Blastp and/or MPSearch Result:

Description:

ADENINE PHOSPHORIBOSYLTRANSFERASE (EC 2.4.2.7) (APRT). -
ESCHERICHIA COLI.

Assembly ID: 3864954

Assembly Length: 1073bp

[SEQ ID NO:] 3864954 Strep Assembly -- Assembly
id#3864954

CTAAATAGGGTATAATATGGGTAATCATTTGTCGTAGGTTTTGTCTGAAATATTGTCCAG
ACAAGGCTCACAGCAGTTAAATCTTCTGAAAAAGTCAGATTTAATAGCTGCTCTTTTTGT
GCTTTTTTTCAAGATTTTGAGCATTTGTAAACAGAGGCTTAAAGATTCTGAAAATTCGTCA
AGAGGACACGGTGATAAGGGGTTTACAACCATATGGCGATTAGAAAAGCCTGATTGACAA
GGCTTGGAAC TTATTTACAAAGGAGAATCATCTTGGCAGGACATGACGTTCAATACGGGA
AACATCGTACCCGTCGTAGTTTTTTCAAGAATCAAAGAAAGTTCTTGACTTACCAAATTTGA
TTGAAATTCAACTGACTCATTCAAAGCTTTCCTAGACCACGGTCTTAAGGAAGTGTTTG
AAGATGTATTGCCAATTTCAAAC TTCACAGACACAATGGAGTTGGAATTTGTTGGATATG
AAATCAAGGAACCAAATACACGCTAGAAGAAGCTCGTATCCACGATGCTAGCTACTCAG
CACCAATTTTTGTAACTTCCGCTTGATCAATAAAGAAACAGGCGAAATCAAGACCCAAG
AAGTTTTCTTTGGTGATTTCCCAATCATGACAGAAATGGGTACTTTCATCATCAATGGTG
GTGAACGTATTATCGTTTTCTCAGTTGGTCCGCTCACCAGGTGTTTACTTTAACGACAAAG
TAGACAAAAATGGTAAGGTGGGCTATGGTTCAACTGTTATCCCTAACCGTGGAGCTTGGT
TGGAAC TTGAAAGCGACTCAAAGATATCACCTACACTCGTATCGACCGTACTCGTAAGA
TTCCATTTACAACCTTGGTTCGTGCTCTTGGTTTCTCAGGTGATGATGAAATCTTTGATA
TTTTTGGTGACAGCGAATTGGTTCGCAACACTGTTGAAAAAGATATCCACAAGAATCCAA
TGGACTCTCGTACAGACGAAGCCTTGAAAGAAATTTACGAACGCCTTCGTCCAGGTGAGC
CTAAGACGGCTGAAAGCTCACGTAGCTTGCTTGTTGGCTCGCTTCCTTGAACC

ORF Predictions:

ORF #	Start	End	Direction	Length
6	414	1070	F	219 aa

[SEQ ID NO:] 3864954-6 ORF translation from 414-1070,
direction F
VFEDVLPISNFTDTMELEFVGYEIKEPKYTL EEARIHDASYSAPIFVTFRLINKETGEIK
TQEVFFGDFPIMTEMGTFIINGGERIIVSQLVRS PGVYFNDKVDKNGKVGYGSTVIPNRG
AWLELESDSKDITYTRIDRTRKIPFTTLVRALGFSGDDEIFDIFGDSELVRNTVEKDIHK
NPMSRTDEALKEIYERLRPGEPKTAESSRSLLVGSLP*

Blastp and/or MPSearch Result:

Description:

DNA-DIRECTED RNA POLYMERASE BETA CHAIN (EC 2.7.7.6)
(TRANSCRIPTASE BETA CHAIN). - BACILLUS SUBTILIS.

Assembly ID: 3864962
Assembly Length: 902bp

[SEQ ID NO:] 3864962 Strep Assembly -- Assembly
id#3864962
GAATTGAGTGTAAGAATATGAGGATCCCTTTAGGGATAGTGGTAAGTAATACCAAAGT
CTCTTAAAGAGGCAAGTGACGAGTCAAGAGCAATAAGGCTTGAACAACGTGAAAGCCAGC
GTCTTTAGGCGCTGGCTGATGATTTGGGCTTATAGCTCTGAGATAAACCACCCGTTAGAC
AGGTGGTTATGATTTTATCTGAGTGTAACATACTGTTGGGCAATCTCGCTGATGCGGTCA
AAGTTGCCTTGGGAAGCGAGTTTATTGAGTTCGCCACCAATTCCAACGGCGTCTGCACCA
GCAGCGAACCATTGAGGGATGTTGTTTAGACCGACTCCTCCGGTTACCATTACGGAAACT
TGTGGGATCGGTGCCTTGACTGCAGAGATATATGCTGGACTGAGAGTACTACTTGGGAAG
AGTTTGATGATTTCACTACCGGCTTCAAGTGCAGTCGTGATCTCTGTGAGGGTAATACAG
CCTGGAATGTACGGTGTGCTGTAGAGATTGCACATTTTCGCAGTTTCAGCATGGAAAGAT
GGAGAAACAACGTAATTTGCTCCGGCTAGAATGGCATCTCTAGCAGTTACGGCATCAAGC
ACAGTACCTGCACCGATACAAACACTCTTATCGTCCTGATACAAGTCTACAAGTTCCTTG
ATGATTTGTCTGCATACTGATTGGTATAGGCGATTTCAATAGCTTTGATACCGCCCTTG

ATACAAGCAATCGAGGCTTGCAGTCCTTCTTCCTTTGTATTTCCCCGAATGACAGCGACA
 ATTTTCGATGTTTTTTTAGTTCAATAATCGTATCTGATTTGGTCATGTAATTCTCCTAAC
 GAATGATATCTTGTGCATTTGCCAGTAAATTTTCAATACTAGTTGCGGAAGTGGAGAGAT
 GG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	195	602	R	136 aa

[SEQ ID NO:] 3864962-6 ORF translation from 195-602,
 direction R
 VLDAVTARDAILAGANYVVSPSFHAETAKMCNLYSTPYIPGCITLTEITTALAEAGSEIIK
 LFPSSTLSPAYISAVKAPIPVQVSMVTGGVGLNNIPQWFAAGADAVGIGGELNKLASQGN
 FDRISEIAQQYVTLR*

Blastp and/or MPSearch Result:

Description:

2-keto-3-deoxy-6-phosphogluconate aldolase (eda) homolog -
 Haemophilus influenzae (strain Rd KW20)

Assembly ID: 3864970
 Assembly Length: 1755bp

[SEQ ID NO:] 3864970 Strep Assembly -- Assembly
 id#3864970
 TTGAGTTAGTACCAATGGACCGACAATTAAAAAGTCATGTTTGCTGATTTTTTCAGAAAAT
 CTTATCCAGAAATGGAAGAGCAGATGAGGCTGATTGACGAGTGTGGTCCTGAACTTTAT
 TTTAAGAACTTAACTCAAGCAACATTTAGTCCTGAAACGAATAAAAAATCTGGGAATTA
 ATGCAAGAAAAAGGCTTAGAGTTGGAAAATCAAGAATCCAGGAATTTTCAGGATATCTGGG
 AGAGATTACTGAGGAAGATTTTGAGAATTTGTCGGATAGAATCTCATGTCCCTGTATTTA
 TTTTTTGTCAGACTTATAGAGAAAAAGAGTACAGAGAATCAGAATATTGGACTTCCAATA
 CTAAACTCATTTTAGGAAGGAATCACCATTATTTACAATGGTCAGAATCGGAAAAAATTG
 CGGCTATTATTCGAGAATTGTCAGAATAAGATGGAAAAAAGGAGATTACAGGAGACAAGA

TGAAC TACTTTAATGTTGGGAAAATCGTTAATACGCAGGGATTACAGGGTGAGATGCGAG
TCTTGTCTGTGACGGATTTTGCAGAAGAACGGTTTAAAAAAGGAGCTGAGCTGGCTTTGT
TTGATGAAAAAGATCAGTTTGTCCAAACAGTGACCATCGCTAGCCACCGTAAACAGAAGA
ACTTTGACATTATTAAATTCAAAGATATGTACCATATCAATACTATCGAAAAGTACAAGG
GATACAGTCTCAAGGTCGCTGAGGAAGATTTGAATGACCTAGACGATGGTGAATTTTACT
ATCACGAGATTATCGGTTTGGAAAGTCTATGAGGGTGATAGCTTGGTTGGAACCATCAAGG
AAATCCTGCAACCAGGTGCTAATGATGTCTGGGTGGTCAAACGAAAAGGCAAACGTGATT
TGCTTTTACCTTATATCCCACCAGTGGTTCTCAATGTTGATATTCCAAATAAACGGGTCTG
ATGTGGAAATCTTAGAAGGGTTAGACGATGAAGATTGATATTTTAACCTCTTCCAGAG
ATGTTTTCTCCACTGGAGCACTCAATCGTTGGAAAGGCTCGAGAAAAAGGGCTCTTGGAT
ATCCAGTATCATAATTTTCGAAAAAATGCTGAAAAGGCCCGTCAAGTTAGATGATGAACC
CTACAGAGGCGGTCAGGGCATGTTGATCAGAGCACAACTATTATCGAATTCCTTAGATG
CTATTGAAAAGAAAAATCCGCGCGATATTCTCCTCGATCCTGATGGAAAGCAGTTTGATC
AGGCTTATGCTGAAGATTTGGCTCAAGAGGAAGAGCTAATCTTTATCTGTGGGCACTTAT
GAGGGTTATGATGAGCGCATTAAGACCTTGGTAACAGATGAGATTTCCCTAGGCGACTAT
GTCCTCACTGGTGGAGAATTGGCAGCTATGACCATGATTGATGCTACAGTTCGCCTGATT
CCAGAAGTGATTGGCAAGGAGTCTAGCCACCAAGATGATAGTTTTTCTTCAGGTCTTTTA
GAATATCCTCAGTACACACGTCCCTATGATTATCGAGGCATGGTTCGTGCCAGATGTATTG
ATGAGTGGCCACCATGAAAAGATTCGTCAGTGGCGATTGTACGAGAGTTTAAAGAAAACC
TACGAGCGCAGACCAGATTTACTTGAACATTATCAACTGACAGTAGAAGAAGAAAAAATG
CTGGCAGAAATCAAAGGAAACAAAGAATAAAGGAGAAACCTATGCAAGTAATCAAACGTA
ATGGCGAAATTTCGAT

ORF Predictions:

ORF #	Start	End	Direction	Length
7	1309	1710	F	134 aa

[SEQ ID NO:] 3864970-7 ORF translation from 1309-1710,
direction F

VGTYEGYDERIKTLVTDEISLG DYVL TG GELAA MT MIDATVRLIPEVIGKES SHQDD SFS
SGLLEYPQYTRPYDYRGMVVPDVLMSGHHEKIRQWRLYESLKKTYERRPD LLEHYQLTVE
EEKMLAEIKGNKE*

Blastp and/or MPSearch Result:

Description:

tRNA (guanine-N1)-methyltransferase (trmD) homolog -
Haemophilus influenzae (strain Rd KW20)

Assembly ID: 3865012
 Assembly Length: 1130bp

[SEQ ID NO:] 3865012 Strep Assembly -- Assembly
 id#3865012

ATCGAATTCATAAATCTTTTCCTTCCAGATACCCAGACAGGCAATCTCTTCTGGAAGTT
 CAACGGCCTTATCCGTCTCGCACACAACCATAACATCTTCAGAAAAAGCTCTCTCTCAG
 CCATTTTTTCAATATCTGCTACGATTTGTTCCCTTGGCATAGGGAGGGTCTAAGAAAACGA
 GGTCAAATTCCCCAGATAACCTGTTCCAATGCCCTTTCTGCATCCATTTTGGAGGAGTTG
 AAATTTTCCAACCTTCCTTGGTCATCTGGATATTTTCAGCCACGATGGTCTGAGCCTTACG
 GTCTCGCTCCACAAAACAGCACTGGACATGCCACGCGATACTGCTTCGATAGATAAACC
 ACCACTACCTGCATAAAGGTCCAAGACTCGTCCCACTTCAAAGTAGGGACCAATCATGTT
 AAAAATGGCTCCCCTAACCTTATCCGAAGTAGGTCTTGTGTCTTGCCTTCTAGTGTCTT
 GAGGGGACGTCCCCATAGATTCTTGATACGATTTTCATACTGTTTATTATACCAAATTA
 TAGACAAAAAGAGAAAGAAAACCGAACCTTGCGGTTTCGATTCTCTACAAAATATTTTCGT
 AAGTATCGCGGACTTCTTGAGGCCAAACACTTGTTCGACTTCTCCGATGTGTCTCTTGC
 GAAGTAGGAACATGGCCATACGAGATTGTCCAATTCCTCCACCGATTGTCAATGGGAATA
 GGCCATTCAACAAAGACTTGTGCCATTCCAATTCTAAGCGGTCTTCATCACCTGTAATTT
 CCACCTGACGTCTAAGAGTTTCTTCATCTACACGAATTCCCATAGAAGACAACCTCAAAGG
 CTCCACCTAAAGACTCATTCCAGACAAGAATATCACCATTTAGACCCTTGTAGCCATTCT
 CAGACTCGCTTGTCCAGTCATCATAGTCTGGTGCACGTCCATCGTGCGGTTTACCATCTT
 GGCAACTCGCCACCGATACCAATCAAAAAGACGGCTCCAAATTCTTTACAAATCGCATTT
 TCCACGTTCTTTAGGTGTCAAGTCTGGGTAGCGTTCTACCAATTCTTCTGTATGGATAAA
 GGTGATTTGTTTTGGCAAGATAGACTCGATGTCATAGCGGGCTTCAACAG

ORF Predictions:

ORF #	Start	End	Direction	Length
7	584	973	R	130 aa

[SEQ ID NO:] 3865012-7 ORF translation from 584-973,
 direction R
 VASCQDGKPHDGRAPDYDDWTSESENGYKGLNGDILVWNESLGGAFELSSMGIRVDEETL
 RRQVEITGDEDRLELEWHKSLNGLFPLTIGGGIGQSRMAMFLLRKRHIGEVQTSVWPQE
 VRDPTYENIL*

Blastp and/or MPSearch Result:

Description:

asparagine synthetase A (asnA) homolog - Haemophilus
influenzae (strain Rd KW20)

Assembly ID: 3865148

Assembly Length: 1825bp

[SEQ ID NO:] 3865148 Strep Assembly -- Assembly
id#3865148

TATAACCACCAGGCTCATGACTATAGTCTTTTATTTCTTCTGTAAAAGACTGGTCTTGCA
GATGGCGGTGCAGGCCAACTGGTCCTTCGATATAACCCATGATTCTTCCTTCTTTTTCAG
CAACCAGAAAAGAGGTCTGAATTTCTCTCAAATGTGCTTCAAAGACAGAAGGAGGAATGG
CTTCTTCGACCGAAAAATTATCAAATTCAAGTTCAACAATCCGATCCAAATCTTCTAATC
TTGCTTGTCTGATTTTCATTGTTCCCTCCAGATAAAAAGGGATTAAACCAAATCATACTATA
GCCCTGGCTAGTTACATAGAGCAAAGTTTCTTCTTCATCAACAAAACCGTTCATTTCAAA
ATAGGAAAGCAGCTCATCAGGACTCTCCAAACGAATCCCTTTGTAATCCAGCTCAACTGC
CACCTCTTTCAAGGCTGCAAGAAGAAGTGTTCCCAGGCCCTGTCTCTGATGGTCGAGACTC
GATGACTAAAGAATGTACTTTTAGACATTGCGGATTGTCTGACTGGGGACTTGATAAAAT
ATAGCCTAAAAGTTGATTTTCATCCCTAGCTAGAAGAAAGGTATCCGCACACTTACGGAT
ACTTCTTCTTAAAATATGGGAAAGTTGCTGCTTTTCAGCTGGAAAAGACGAGGTCTGAAG
TGCCCCCTATCTCAGGCAAATCAAACCTTGCTTGCTGAATGATCTTAATTGGAATTTCCAT
GGGAAACATCCTATTGAACATTGCTTGTCAAGTTAGACAAGAGACGCTCAAATGAGTATT
CATAGGTTTGGATGTCTCCTGCTCCCATAAAGACGTAAACAGCATTGTCATGGTCTAGGA
GTGGAGAAACATTTTCAACAGTAATCACTTGGTGTTTTTTGTGATTTTATTGGCTAGGT
CTTCTACCTTAACGTCACCATGATCTACTTCACGAGCCGAGCCATAAATTTGCGCTAGAT
AAACAGCATCTGCTTGGTTTAAAGCATGGGCAAAGTCGTCCAACAGGGCAATGGTTCTTG
TAAAGGTATGCGGTGGAAAGAACTGCTACAATTTCTTGCTTGGGTATTTCTGACGAGCC
GCATCCAAGGTCGCAATAATTTCTGTTGGATGATGGGCAAAGTCATCAATAATCACTGTA
TCATTGACAATTTTCTCAGTGAAACGACGTTTAAACACCGGCAAATGTTTTCAAGTGCTCA
CGCACCAAGTTCAAATCAAATCCTGCTGTGTAAAGAAGACCAATAACGGCTGTGCGATTCT
ATGATATTGTGACGACCAAAGGTTGGAATGTGGAATTGCCCCAAGTTTTGTCCACGGAAA
TGAACGGTGAAGGTTGAACAGTTGTTGAACGAAGAAGATCACTAGCTACAAAGTCATTG
CCTTCAGCTTCAAACCATATAATAAATTGGTGCATCAGACGTAATCTTACGCAATTCA
GCATCTTCACCATAGACAAAAAGACCCATCGTAATTTGTTTGGCATAGTCGTTAAAGGCA
TTGAAAACATCCTCGAGACTTGTGAAATAATCTGGATGGTCAAAGTCAATGTTGGTGATA

ATAGAGTATTCTGGGTGGTAAGGCATGAAGTGACGCTCATATTCGTCAGATTCAAAGACA
AAATATTTGGCATTGGCCGAACACGACCTGTCCCATCTCCAATCAAGAAGCTGGTATCT
GTAATGTGAGACAAGACATGAGACAACATACCTGTCGTTGAAGTTTTTCCATGTGCTCCT
GCTACTCCCATGCTAACAAAGTCACGCATAAAGCTACCTAGAAACTCATGGTAACGTTTG
TAGCTGATACCATTTTGGTCCGCAT

ORF Predictions:

ORF #	Start	End	Direction	Length
6	256	423	R	56 aa
7	731	868	R	46 aa

[SEQ ID NO:] 3865148-6 ORF translation from 256-423,
direction R
VAVELDYKGIRLESPDELLSYFEMNGFVDEEETLLYVTSQGYSMIWFNPFYLEEQ*

Blastp and/or MPSearch Result:

Description:
unknown

[SEQ ID NO:] 3865148-7 ORF translation from 731-868,
direction R
VITVENVSPLLDHDAVYVFMGAGDIQTYEYSFERLLSNLTSNVQ*

Blastp and/or MPSearch Result:

Description:
UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6.3.2.8) (UDP-N-
ACETYLMURANOYL-L-ALANINE SYNTHETASE) (FRAGMENT). -
BACILLUS SUBTILIS.

Assembly ID: 3865178
Assembly Length: 1002bp

[SEQ ID NO:] 3865178 Strep Assembly -- Assembly
id#3865178

ATCGAATTAAGGTAAACTAAAAGGACTTAGTCCTGTGCAGTACAGAACTAAATCCTTCG
GATAGAATTATTTGTCTAACTTTTTGGGGTCAGTACACCTAAACTTTGATGATATACGT
TTCCTTGTGAGAATATTTACTTCATTTTGCCTAAAATTCAATGTTTACTCAGTATTTGG
ATTATGAAAAATCGAGGTCTAAATCTAGATACATTTTTTCTGAAGACAAATCATTTTGAC
CACCGAGCAAGAGATTTTCAAAAAAGCTGTTAAAACTCAGAACGTCGCTGTAAATCT
TTGCATTATCTAATACCAAGGCATCACGAAAATATTTGGAATGTTGCTGAAATGGTGTAT
TATCAATATCAAAACCAAACCTCACGAAGATACTGAATCAAAAAGACCGTTACTGTCCGAG
TGTTTCCTTCGCGAAATGGATGAATCTGCCAGATTCCTGAAATAAAATGCTGGATTTGTT
TAACCACATCCGCCTGAGTTAGTGTGCGCATATGCAACTTGTTTTCTGATTAAAATCAT
AATCTAAGGTCATTTGAATCATGGAGTAATCAGAGTACACAACACTTTCACCATTCAAAA
CAGGTTCAATCCTTTGTGATATTGGTCTGACGAAATTCGATCCACCGGAAATAGAGGGTTC
AAATATATCTTGAAACAACCTCCTTATGAATAGCAAGTAAGGTCGCAGGACTAAAGCTAAA
GCCTCTTCGAGACAATAGTTCTACAATACGTTAGAGAAACCAAGTCTGCCTCCTTCCCGT
ACTTGCATCAATAATATGGTGAATAAGCCGGTGCATTCCTCATAAACCTGCTCATAAGTC
AGTTCTCCCGGGACTGTTTCTCAGCCAAAGATTCCATATACGCTGATGGCACTAGATTG
TCAACTTTCTGCAGACCAAAACCTATCCGCCATAAATCACGCTTCGCTTCATAAGACAAG
TTTGGATTGTCAATGTTGTAAGTTGGTTCATAAAAATATCC

ORF Predictions:

ORF #	Start	End	Direction	Length
6	182	580	R	133 aa

[SEQ ID NO:] 3865178-6 ORF translation from 182-580,
direction R
VYSDYSMIQMTLDYDFNQEKQVAYATLTQADVVKQIQHFISGIWQIHPFREGNTRTVTVF
LIQYLREFGFDIDNTPFQQHLSKYFRDALVLDNAKILQRRSEFLTAFENLLLGGQNDLSS
EKMYLDLDFLDFS*

Blastp and/or MPSearch Result:

Description:
unknown

Assembly ID: 3865260
 Assembly Length: 1250bp

[SEQ ID NO:] 3865260 Strep Assembly -- Assembly
 id#3865260

CTGTCACNACTCCATTTACTACCGATTGCCATGAACACCAAACCACCACAAAAATGATAT
 AAAGAATGCAATTCCAATAGCACCATACAAAGATCCAGTTAAACCTTGCAACGGAACCTG
 AATAGCAGAATAAATCATTCTATGAATGTTCCGCCATTAGTCAATGACTTCGCTAAAAAT
 ATATACAATCATAGAAGATAAGAAAATTACAAATGCTGGAATCATTGCTTCAAACCTGTTT
 GGCAATAGCTTGTGGAACCTGTTCTGGCATCTTAATAACAATTTTTCTCTTTATAAAGAA
 GGTATAAATACTTCCTACTACCAAACCTATAATGATAGCACCATAATTCCCTTGGCCTC
 CAAACCAAACCTTTACTAATAGCGTCCCCAATCGCCTCACCTTGTTTAGGGATATAAGATG
 ATCTTAGCAAAATAAAGAATGCAGATACAGATAGAACTCCAGCTGGTAAAGCCTCTACTC
 CGCTATTCTTAGCATAAGAATAGGCAATTGAAAAACAAGAAATTAGACCCATAATAGCAA
 AAGTTCCTGAATATACTTGCATAAACGGCTCTGTCCAATTAGCTCCAAAAACACTAGCAA
 TGCTCTTATTTAATCCTTCGAACGGCAATTGTCCATAATCAAGAACAACTACCAACTA
 CTGTCAATGGCAAAATTGCTAACATCCCATCTTTTAGAGCTATAATGCCACGCATATTCA
 CAACTTCATCATCGGTGCAATGATTTTCTGAACATCCATCTTGACATAATAAATCTCC
 TTTTCTTACCCACTAATCAAAGATAGGGCCAAATCTAATACTTTTTTCCCATCTAACATA
 CCATAGTCCATCATCGGAATAACAGCTATCGGAACATCACACTTATCACAAATTTCTTTT
 GATTTATCTAATGTATAAGCAACTTGTGGACCCAATAGTGCAACATCTATATTTGGCGCA
 TAATCCGCTAATTTAGACTGAGAAAACGCCTCTATTTCTGCCTCAACTCCACTAGCTTGC
 GCTGCAATTTTCATATTATTTACAAGCATACCAGTAGAAAAAACCTGCTGCACAAAACAA
 ACCAATCTTCACCATATGTTTTCTCCTCTATGTTAATAACAATGATAATACTCTAGTA
 ATAATTTTTTATGAAGTTTCTTTTCTCAAATAAATAATTTCCCTTTGAATTAAATTAATC
 TCCGGTCATACTAGTCCATGAAAANGATCTTGTGAATGAACCAAGAAGAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	19	399	R	127 aa
7	272	793	R	174 aa
8	786	1073	R	96 aa

[SEQ ID NO:] 3865260-6 ORF translation from 19-399,
 direction R
 VRRLGTL LVKFGLEAKGIIGAIIGLVVGSIIYTFIKRKIVIKMPEQVPQAIKQFEAMI

PAFVIFLSSMIVYILAKSLTNGGTFIEMIYSAIQVPLQGLTGSLYGAIGIAFFISFLWWF
GVHGNR*

Blastp and/or MPSearch Result:

Description:

cellobiose phosphotransferase system celB - Bacillus
stearothermophilus

[SEQ ID NO:] 3865260-7 ORF translation from 272-793,
direction R
VGKKRRFIMSKMDVQKIIAPMMKFVNMRIIALKDGMLAILPLTVVGSFLIMGQLPFEG
LNKSIASVFGANWTEPFMQVYSGTFAIMGLISCFSIAYSIAKNSGVEALPAGVLSVSAFF
ILLRSSYIPKQGEAIGDAISKVWFGGQGNRYRCHYRFGSRKYLYLLYKEKNCY*

Blastp and/or MPSearch Result:

Description:

cellobiose phosphotransferase system celB - Bacillus
stearothermophilus

[SEQ ID NO:] 3865260-8 ORF translation from 786-1073,
direction R
VQQVFSTGMLVNMKIAAQASGVEAEIEAFSQSKLADYAPNIDVALLGPQVAYTLDSKE
ICDKCDVPIAVIPMDYGMLDGKKVLDLALSLISG*

Blastp and/or MPSearch Result:

Description:

cellobiose phosphotransferase system celA - Bacillus
stearothermophilus

Assembly ID: 3865272

Assembly Length: 1164bp

[SEQ ID NO:] 3865272 Strep Assembly -- Assembly
id#3865272

AATGTAATGCGGCGAGCAAGGACGTGAAGACGCCTTTGTAGATCCACTTGCAGATATTGA
TACAATTAATCTGGAATTAATTCTTGCTGACTTAGAATCAGTGAACAAACGATATGCGCG
TGTAGAAAAGATGGCACGTACGCAAAAAGATAAAGAATCAGTAGCAGAATTCAATGTTTC
TTCAAAAGATTAAACCAGTCCTAGAAGACGGGAAATCAGCTCGTACCATTGAATTTACAG
ATGAGGAACAAAAGGTTGTCAAAGGTCCTTTTCCTTTTGACGACTAAACCAGTTCCTTTATG
TAGCTAATGTGGACGAGGATGTGGTTTCAGAACCTGACTCTATCGACTATGTCAAACAAA
TTCGTGAATTTGCAGCGACAGAAAATGCTGAAGTAGTCGTTATTTCTGCGCGTGCTGAGG
AAGAAATTTCTGAATTGGATGATGAAGATAAAAAAGAGTTTCTTGAAGCCATTGGTTTGA
CAGAATCAGGTGTAGATAAGTTGACGCGTGCAGCTTACCACTTGCTTGGATTGGGAACCTT
ACTTCACAGCTGGTGAAAAAGAAGTTCGCGCTTGGACTTTCAAACGTGGTATGAAGGCTC
CTCAAGCAGCTGGTATTATCCACTCAGACTTTGAAAAAGGCTTTATTCGTGCAGTAACCA
TGTCATATGAAGATCTAGTGAAATACGGATCTGAAAAGGCCGTAAAAGAAGCTGGACGCT
TGCGTGAAGAAGGAAAAGAATATATCGTTCAAGATGGCGATATCATGGAATTCCGCTTTA
ATGTCTAAAAATTAATAAATGGTGTCAATTAGGTTGGAAAAAAATTCCAACCTTTTGGC
TTTTGAAAGGAAAAATAAATGACCAAATTACTTGTAGGCTTGGGAAATCCAGGGGATAAA
TATTTTGAACAAAACACAATGTTGGTTTTATGTTGATTGATCAACTAGCGAAGAAACAG
AATGTCACCTTTTACACACGATAAGATATTTCAAGAATTCGGACCTAGCATCCTTTTCCCT
AAATGGAGAAAAAATTTATCTGGTTAAACCAACGACCTTTATGAATGAAAGTGGAAGC
AGTTCATGCTTTATTAACCTACTATGGTTTGGATATTGACGATTTACTTATCATTTACGA
TGATCTTGACATGGAAGTTGGGAA

ORF Predictions:

ORF #	Start	End	Direction	Length
6	101	193	F	31 aa

[SEQ ID NO:] 3865272-6 ORF translation from 101-193,
direction F

VNKRYARVEKMARTQKDKESVAEFNVSSKD*

Blastp and/or MPSearch Result:

Description:

unknown

Assembly ID: 3865280
Assembly Length: 1320bp

[SEQ ID NO:] 3865280 Strep Assembly -- Assembly
id#3865280

CGAATTCAGGTTTCTTTTGTGTCCTTCCATTCGTTTACGTTTAATCTTTGAATCGAGG
GATGATGTTCTTTTGAAGCAATTAGTTTTAGAATCATCTACTGAGGTTATTAAATCTGTA
GAGGTAGAGAGTTTTGAGTTTGAAACAGGAAGACAATATTTTCTATCCGGAAAAGAACAA
GATTGTATTAAGGAAATGGCGAATTTTCCGGTTATTATCTACGAATTGGGACCACCTGT
TTATCCCAATTCTTTATTCTTAGGAATGGAATTTCCAATGTCCTGAAAACAAGGTAGATGG
TAGACACTATGTATCAAGATATTACTTGGGAAGTGTGTAAATCACCAAAAAAAGTTTG
TGGTCTTGTTATTATTGGGGGAGCATGTTCTTATAAAAAAGAAGAGATTCAAGAGGCATTT
TTTGAATATGTTGAAGGAATAGCTCAACCTAGTTATTTCCGTAAACAGTATAATTCCTGG
TATGACCATATGACCGATATTACAGAGGAAGGTATTTTAAAAAGTTTTTCTGAGATTCGA
GATGGATTTGAAAATCATGGAGTTCATTTAGATGCTTATGTTGTTGATGATGGTTGGACA
AACTATCAATCAGTTTGGGAATTCAATCATAAATTCCCAAATGGTTTGAGAAATATTAAA
TATCTTGTAATGGATTTGGTTCCAACCCTAGGATTGTGGATTGGTCCCCGAGGTGGTTA
TAATGGGACAGAAATCATTATGAGTTGATTGGTTAGAAGCACATCCCAGAGTTTAAATAT
TGGATCTAAAAATTTGATTTCAAATGATGTAAACGTGGCTGATTTTAACTATCTCAATCA
AATGAAGAAAAAGATGTTGGAATATCAAAAAGAATTCGATATCAGCTATTGGAAAATTGA
TGGTTGGTTACTTCAACCTGACAAACCTGATAAGAGTGGACCGCACGGTATGTATACCAT
GACAGCGGTTTATGAGTTCCTTAATTCAACTGTTGATAGATCTAAGAAAGGAGAGAGGAGG
AAAAGATTGTTGGTTAACTTGACTTCTTATGTAAATCCTAGTCCATGGTTTTTACAGTG
GGTCAATAGTTTATGGATTCAAATATCTCAAGATGTAGGCTTTACAGAGAATGCAGGTAA
TGATATCAATCGTATGATTACTTACCGAGATAGTCAGTATCAAGAAATTTTGGGAAAAC
GTGAGATACAGTTACCTATGTTGGGTCGCTTTTATAAATCATGAACCAATCCTATGCTGT
CAGTGCCAAATACCTGGTACATGGATCATCAAATGTTTGCATCAATACCAGATTTTGAAG

ORF Predictions:

ORF #	Start	End	Direction	Length
7	815	1204	F	130 aa

[SEQ ID NO:] 3865280-7 ORF translation from 815-1204,
direction F
VADFNLYNQMKKKMLEYQKEFDISYWKIDGWLLQPDKPKDSGPHGMYTMTAVYEFLIQLL
IDLRKERGGKDCWLNLTSYVNPSPWFLQWVNSLWLIQISQDVGFTEENAGNDINRMITYRDS

QYQEFLGKT*

Blastp and/or MPSearch Result:

Description:
unknownAssembly ID: 3865286
Assembly Length: 1305bp

[SEQ ID NO:] 3865286 Strep Assembly -- Assembly
id#3865286

CTTAGAAGAAAAGGCTGAGGGCAAATACTAGTCTGTTCGAGTTTCTTCTGTCATTGCGCG
TGATCTCTTTCTGGAAAATCTTGAAAATCTGGGACGAGAACTGGGTTATCAGCTTCCAAG
TGGAGCTGGAACGGCTTCTGACAAGGTGGCTAGCCAGATTTTGCAAGCCTATGGTATGCA
GGGACTCAACTTCTGCGCCAAATTGCACTTTAAAAACACTGAAAAAGCGAAAAACGCTT
AGAAAAGGTAAGTTATGAATTCATTTAAAAATTTCTTAAAAGAGTGGGGACTGTTCCCTCCT
AATCTGTCAATTACTAGCTTTAAGTCGTATCTTTTTTTGGAGCAATGTTTCGCGTAGAAGG
ACATTCCATGGATCCGACCCTAGCGGATGGCGAAATTCTCTTCGTTGTAAAACACCTTCC
TATTGACCGTTTTGATATCGTGGTGGCCCATGAGGAAGATGGCAATAAGGACATCGTCAA
GCGCGTGATTGGAATGCCTGGCGACACCATTCGTTACGAAAATGATAAACTCTACATCAA
TGACAAAAGAAAACGGACGAGCCTTATCTAGCAGACTATATCAAACGCTTCAAGGATGACAA
ACTCCAAAGCACTTACTCAGGCAAGGGCTTTGAAGGAAATAAAGGAACCTTCTTTTAGAAG
TATCGCTCAAAAAGCCCAAGCCTTCACAGTTGATGTCAACTACAACACCAACTTTAGCTT
TACTGTTCCCGAGAAGGAGAATACCTTCTCCTCGGAGATGACCGCTTGGTTTCGAGCGACA
GCCGCCACGTTAGGTACCTTCAAAGCAAAAGATATCACAGGGGAAGCTAAATTCGCTTC
TGGCCAATCACCCGTATCGGAACATTTTAAGAAACCTAAGAGGCCGAGAATCACCAATCT
CAGCCTCTTCTTCTATCGTGAGAAAATGATTGGTACTATCTAAACTTACCAGAACAGAAA
CACCTCAACTCTCACCTATTCATGCAAAGGAATTCGATGGAAGTTTATTTTTTCAGGAACT
ATTGAACGGATTATTTTTGAAAATCCAGCAATTTTATCGCATCCTCCTCCTAGAAATC
GACGATACGGACGCAGAGGATTTTGATGATTTTGAAATCATTGTCACAGGAACCATGGCT
GATGTAATTGAGGGCGAAGACTATACTTTTTGGGGGCAAATTGTCCAGCACTCCAAGTAT
GGAGAACAACTGCAAATCAGTCGTTATGATCGCGCAAAACCAACTAGTAAGGGCTTGGTC
AAGTACTTTTCAAGTAGCCATTTCAAGGGATTGGTCTCAAGACAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	146	250	F	35 aa

[SEQ ID NO:] 3865286-6 ORF translation from 146-250,
direction F
VASQILQAYGMOGLNFCAKLHFKNTEKAKKRLER*

Blastp and/or MPSearch Result:

Description:
unknown

Assembly ID: 3865326
Assembly Length: 804bp

[SEQ ID NO:] 3865326 Strep Assembly -- Assembly
id#3865326
CTATGCTTGTAAGGGCTTTGCTTTTCAGGATCAGTTGCCTTACTTGTCGGGCATTCCAACCT
TGGTCTTGTAAGGGGGACTATCTTGCGGTAGCAACTCTGGGTGTTTATCGAAATTATCCGT
ATCTTTATCATCAATGGTGGGAAGTCTTACAAATGGTGCGGCAGGTATCTTAAGGATTCCT
AACTTTACAACCTGGCAAATGGTTTACTTCTTTGTGCGTGATTACAACCATTGCAACCTTG
AACTTCTTGCGTAGCCCAATTGGACGTTCAACCCTCTCTGTTCTGTAAGATGAAATCGCT
GCTGAGTCAGTTGGGGTTAATACGACTAAAATTAAAATCATCGCTTTTGTCTTTGGTGCC
ATTACTGCAAGTATTGCTGGGTCACTTCAGCCAGGATTAATCGGGTCTGTTGTACCGAAA
GATTACACCTTCATCAACTCAATCAACGTTTTGATTATTGTTGTATTTGGTGGACTCGGT
TCCATTACAGGTGCGATTGTTTCGGCTATTGTTTCATCGAATTTGAATATGCTTCTCCAA
GATGTTGCTAGTGTGCGTATGATTATTTACGCTTTGGCCTTGGTATTGGTAATGATTTTC
AGACCAGGTGGACTCCTTGGAACGTGGGAAGTGAACCTATCACGTTCTTTAAAAAATCT
AAGAAGGAGGAACAAAACATAATGGCATTACTTGAAGTAAAACAGTTAACCAAACATTTTG
GTGGTCTAACAGCTGTTGGAGATGTGACTCTGGAATTGAACGAAGGGGAAGTGGTTGGAT
TAATCGGTCCAAACGGAGCTGGGA

ORF Predictions:

ORF #	Start	End	Direction	Length
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 7 100 681 F 194 aa

[SEQ ID NO:] 3865326-7 ORF translation from 100-681,
 direction F
 VFIEIIRIFIINGGSLTNGAAGILRIPNFTTWQMVYFFVVTITLNLRSPIGRSTLS
 VREDEIAAESVGVNTTKIKIIAFVFGAITASIAGSLQPGLIGSVVPKDYTFINSINVLII
 VVFGGLGSITGAIVSAIVHRILNMLLQDVASVRMIIYALALVLMIFRPGGLLGTWELSL
 SRFFKKSKKEEQN*

Blastp and/or MPSearch Result:

Description:

HIGH-AFFINITY BRANCHED-CHAIN AMINO ACID TRANSPORT PROTEIN
 BRAE. - PSEUDOMONAS A ERUGINOSA.

Assembly ID: 3865438

Assembly Length: 553bp

[SEQ ID NO:] 3865438 Strep Assembly -- Assembly
 id#3865438
 CCCATCTGCCTTGACCAAAGGCTACCACTTCAAACTCGCCTCACCTTGGAATTTTCA
 GCTTTAGATGGGCATTACCTGCCCCAGTAGTACGAGCACTTTCGACCTGAAAATCTTG
 ATATAAAAAATAGGTTTCTGATTATCCATTCCAAAAGGAGCTAAACGTTCAAACTTTG
 ACCGTTTCCAAGCTAAGTGCCTCCAAATCCAACCTTTCATCTAGGTTTAACTTATTCTTT
 CCACCAGCATCTGCACCTTTTTCACGAACATAATCTTCCAAAACCTGAGATAAATCTGAG
 AGTTGCTCAACTTCCAGCGTCATACCCGCTGCACCTGCATGACCTCCAAAGGCGATGAAG
 AGGTCTCGATGGGGATCCAGAGCTTCAAAAATATCGACCGCTTCCACACTACGAGCACTG
 CCCTTGGCAGACCGTCTTCTATATTAAGAAACAATGACTGTCTGTCCCAATTCTTCCAA
 TAAACGACCAGCCACGATTCCTAGAACCCAGGATTCCAGCCTTCCTTGGCCAAGACCTG
 AACTTTTTCTCAG

ORF Predictions:

ORF #	Start	End	Direction	Length
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6 75 407 R 111 aa

[SEQ ID NO:] 3865438-6 ORF translation from 75-407,
direction R
VEAVDIFEALDPHRDLFIAFGGHAGAAGMTLEVEQLSDLSQVLEDYVREKGADAGGKNKL
NLDEELDLEALSLETVKSFERLAPFGMDNQKPIFYIKNFQVESARTTGGR*

Blastp and/or MPSearch Result:

Description:
unknown

Assembly ID: 3865446
Assembly Length: 965bp

[SEQ ID NO:] 3865446 Strep Assembly -- Assembly
id#3865446
ACATCTTAAGATTAATTTTCAGAATCTTCTCTTGAAGACTTTTTAAAGTTGGTCGTCTATA
GGGAGTTTTTGGCCATCGTTGCTCAATTGTCTGATTAAGGTCCTACCCTTGATGAAACAA
TTATTATCCATGTTTTCTTTATTATAGACAAAGTAAGAAGACGTTTCTCGAATGTAGACT
TTATATTTTTTATGATTTTCTTCTTCCATAATATCCAATTGATAGTTGGGAATGAAAATA
AGACCGCTCTGTTTGACACCGAAAGACACCTTGATATAGACGCCCTTATCAACTAGCTTC
TCTATTTGGTTCTCTGCAAGTTCCACTTCAAATTCACGAACGGTATCTCATTTTTTCCTTA
AATGTCTTAAAGGCTTCCTCAATCTCTTCAGTGGATACTTTATCCTTATCTCGTTCTTCT
TGGAAAGCATGGTACTGTTCCCTGTAAATTCTCTAATCCTTCTGAAGCAACGACTTCCTTA
TTTTTAAAATAATCTTGAAAAAATTTGACATCATATAATTTCTTATCACTTATTTTTTTGA
TGACCCAAACTTATCTTTTGATTATTTTCTTCCAGGATAAAAAGTTACATTTTTTTTGTTTT
AAGTCAATGGTTAGATTCAATTCCTTTTGCTTTTGTTATTAAATCTTCTAAAGAATTGACA
CGGTTTAACAAAAATTCATAACGACTTTCAATCTCTTGCTTAGCAAAATGCGTTCTAAAA
AATTCTTCATCATATAGATCTCGTTTGCTGAGTTGGCGCCCTCGAATTGGTTTTATCATC
GTTCTATCTGTCATCAAAAAACGGCTATGCTTTTGACTAAAATCAATCTGAACATGCAAC
TGCTTTGCTTTCTCTAAAAAATCATCAAACGATTTAGATTGCTGAAGCAAAAAATAAAGA
CGTTGTTTCAATTCAAATTTATGACTAGATTCCTTATATTTTTTTATAATCTCGATAGGAA
TAACG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	42	326	R	95 aa

[SEQ ID NO:] 3865446-6 ORF translation from 42-326,
 direction R
 VELAENQIEKLVDKGVYIKVSFGVKQSGLFIPNYQLDIMEEENHKKYKVYIRETSSYFV
 YNKENMDNNCFIKGRTLIRQLSNDGQKLPIDDQL*

Blastp and/or MPSearch Result:

Description:
 unknown

Assembly ID: 3865474
 Assembly Length: 795bp

[SEQ ID NO:] 3865474 Strep Assembly -- Assembly
 id#3865474
 TCCCAAGCAAATCCTTGATAGCATGGACTTTGCTGTCAACGTTTCATGCCTCCTTCCTTCC
 TAGACACCGTGGTGGTGC GCCTATCCATTATGCCTTGATTCAAGGGGATGAGGAAGCTGG
 TGTGACCATCATGGAATGGTTAAGAAAATGGATGCAGGAGATATGATTTCTCGTCGCAG
 CATTCCGATCACAGATGAGGACAATGTTGGCACCTTGTTTGAAAAATTGGCGCTAGTTGG
 TCGTGATTTGCTTTTGGACACTCTGCCTGCCTATATTGCTGGTGATATCAAACCTGAACC
 GCAGGATACGGAGTCAGGTACCTTCTCTCCAAATATAAAGCCAGAGGAAGAAAACTGG
 ACTGGAACAAAACCAATCGTCAACTCTTTAACCAAATTCGTGGAATGAACCCCTGGCCTG
 TTGCCCATACTTTCTTAAGGGCGACCGCTTTAAGATTTATGAAGCCCTACCAGTAGAAG
 GTCAGGGAAATCCAGGTGAAATTCTCTCTATCGGCAAGAAAGAATTGATTGTGCGCAACGG
 CTGAAGGGGCTCTATCCCTCAAACAAGTGCAGCCAGCTGGTAAGCCTAAGATGGACATTG
 CTTCTTCCTCAACGGAGTTGGACGTACATTGACTGTAGGAGAACGATTTGGTGACTAAA
 GTAGAAACGGCTAGAAGTTTAGCTCTAGCAGTGCTAGAGGATGTTTTTGTGAACCAAGCA
 TATTCAAATATCGCCTTAAATAAACACCTCAAGGGGAGTCAGCTTTCTGCAGCAGACAAG
 GGCTTAGTGACCGAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	243	659	F	139 aa

[SEQ ID NO:] 3865474-6 ORF translation from 243-659,
direction F
VICFWTLCLPILLVISNLNRRIRSQVTFSPNIKPEEEKLDWNKTNRQLFNQIRGMNPWPV
AHTFLKGDRFKIYEALPVEGQGNPGEILSIGKKELIVATAEGALSLKQVQPAGKPKMDIA
SFLNGVGRTLTVGERFGD*

Blastp and/or MPSearch Result:

Description:
methionyl-tRNA formyltransferase (fmt) homolog - Haemophilus
influenzae (strain Rd KW20)

Assembly ID: 3865476
Assembly Length: 816bp

[SEQ ID NO:] 3865476 Strep Assembly -- Assembly
id#3865476
CTGGTAAATTTGAGGAAACCTTGATGGTCTAAAAGACAAGTACACCATGCTTCTGGTAA
CCCGTNCATGCAGCAAGCTTCACGTATCTCTGATAAGACAGGATTTTTCCTAGATGGAG
ATTTGATTGAATTTAATGATACCAAGCAGATGTTCCCTTAATCCCCAACACAAGGAAACG
GAAGACTATATTACAGGAAAATTTGGATAAGGAGATGAAAGATGTTACGATCTCAATTTG
AAGAAGATTTAGAGAAAATTACATAACCAGTTCTACGCTATGGGACAAGAAGTGCTCTCAC
AAATCAATCCGTACGGTACGTGCTTTTGTACGCATGACCGTGACCTGGCAAAAGAGGTC
ATCGAAGATGATGCAGAAGTAAATGAATACGAAGTGAACTGGAAAAGAAATCATTTGAA
ATGATCGCACTCCAACAACCAGTCTCTCAAGATTTGCGTACAGTCTTGACTGTCCTTAAG
GCTGTATCAGATGTGGAGCGTATGGGGGATCACGCTGTAGCCATTGCTCAGGCAACCATC
CGTATGAAGGGGGAAGAGCGCATTCAGCTGTAGAGGAAGAAATTTAAAGAAATGGGACG
TGAAGTTAAAGCGTTGTTGAAGCAGCACTTGATCTTTATCTTAATGGTTCTGTTGACGA
CGCATACCGGGTGGCCTCCATGGGATGAGCAAATTAACCACTATTTTGAACTATCCGTG
AACCTTGCGACTGAATGAAGATTAAGAAGAGTTCCAATCCAGAAGCCATTGTGACGGGTC
GTGATTATTTCCAAGTTATTTCTACTTGGGAGCGT

ORF Predictions:

ORF #	Start	End	Direction	Length
6	394	603	F	70 aa

[SEQ ID NO:] 3865476-6 ORF translation from 394-603,
direction F
VKLEKKSFEMIALQQPVSQDLRTVLTVLKAVSDVERMGDHAIAQATIRMKGEEIPAV
EEEIKRNGT*

Blastp and/or MPSearch Result:

Description:

Probable phosphate regulator PhoU homolog

Assembly ID: 3865502

Assembly Length: 1041bp

[SEQ ID NO:] 3865502 Strep Assembly -- Assembly
id#3865502

CTGAAATTGCACCACCAGATGGGATTGGGCAGGTTCTCAGCAACCTCTTGCTCAAACCTGG
TTGACAACCCAGTCAACGCCCTGCTTACTGCTAACTATATTAGAATCTTATCTTGGGCAG
TCATTTTTTGAATCGCTATGAGAGAAGCCAGTAAAAATAGTAAAGAATTGCTAAAAACTA
TCGCTGACGTGACTTCTAAAATTGTCGAATGGATCATCAATCTGGCTCCATTTGGAATCC
TTGGTCTTGTTTTTAAAACCATTTCTGACAAGGGAGTCGGAAGCCTTGCCAACTACGGTA
TTTTATTGGTTCTATTAGTAACGACTATGCTTTTTTGTGCCCCCTGTGGTCAACCTTTGA
TTGCCTTCTCTTTATGAGACGCAATCCTTACCCTCTAGTTTGGAAGTGCCTCCGTGTTT
AGCGGGTGTGACAGCCTTTTTCACTCGTAGTTCTACGACTAACATTCCCTGTCAACATGAA
ACTCTGCCATGACCTTGGACTCAACCCAGATACCTATTCTGTTTCTATCCCACTCGGTTT
TACTATCAATATGGCTGGAGTAGCGATTACCATTAACTTTTGACCCTTGTTACAGTTAA
CACTCTTGGAATTCCTGTTGACTTTGCCACAGCCTTTGTCCTCAGTGTGGTAGCAGCTAT
CTCAGCCTGTGGTGCTTCAGGTATTGCCGGAGGTTCCCTCCTTCTTATCCAGTTGCTTG
TAGCCTTTTCGGTATTTCTAACGATATTGCCATACAAATTGTTGGGGTTGGTTTTGTGAT
TGGTGTGCATCCAAGACTCATGTGAAACAGCCCTTAACTCTTCTACAGATGTCCTCTTTAC
CGCCGTTGCCGAATACGCAGCAACCCGTAAAAATAACTCATCAAGGCAAGCCTGCCTTAT

GTCTTGTCTTTTACGCTTTTATTCTAACTTATTAGGAAATTCTTATGTCTATTAGCCAAC
 GTACGAACAAGCTCATCTTAGCTACCTGTCTTGCCTGCCTGCTTGCTTATTTTCTCAATC
 TTTCATCAGCAGTTTCGGCTG

ORF Predictions:

ORF #	Start	End	Direction	Length
-----	-----	-----	-----	-----
6	428	877	F	150 aa

[SEQ ID NO:] 3865502-6 ORF translation from 428-877,
 direction F
 VTAFSTRSSTTNIPVNMKLCHDLGLNPDYSVSIPLGSTINMAGVAITINLLTLVTVNTL
 GIPVDFATAFVLSVVA AISACGASGIAGGSLLLIPVACSLFGISNDIAIQIVGVGVFIGV
 IQDSCETALNSSTDVLF TAVAEYAATRKK*

Blastp and/or MPSearch Result:

Description:

Probable sodium-dicarboxylate symporter

Assembly ID: 3865694

Assembly Length: 544bp

[SEQ ID NO:] 3865694 Strep Assembly -- Assembly
 id#3865694

CTGATGACACAAAGCACAGTGGGTAGGACTTGCGAAGTCACCCTTTTCTTTTCAAATTT
 ATACTAAATCATTTGATATCAGTGTAGTCACGATTAAGTCCTTGAGCAACTGGTAGGCTAG
 TCAAGTAACCTTGATAAGTGGTCACACCTTGACGCAAGCCTTCATCTTCAGAGATTGCTT
 GTGCGAATCCTTTGCCAGCCAAAGCTTCGATATAAGGAAGAGTGACATTGGTTAGGGCGA
 TGGTTGAAGTGCGGGCAACCGCACCAAGGATATTGGCAACGGCATAGTGGAGAACACCGT
 GTTTTTCATAGACGGGTTCATCGTGCGTTGTACACGGTCAGCTGTTTCGATAACGCCAC
 CTTGGTCAACAGCAACGTCAACGATACAGAGCCTGGACGCATTGTTTGACCATCTCATC
 TGTCACCAATTCCGGTGCTTTTGCACCAAGGATGAGAATGGCTCCAATCACCACATCAGC
 ATCTCTCATACTTGCTTCAATGTTGAATGAATTAGATATAAGAATTTGAATTTGACTTCC
 AAAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	59	334	R	92 aa

[SEQ ID NO:] 3865694-6 ORF translation from 59-334,
direction R
VTTHDEPVYEKHGVLYAVANIPGAVARTSTIALTNVTLPYIEALAGKGFQAISEDEGL
RQGVTTYQGYLTSLPVAQGLNRDYTDINDLV*

Blastp and/or MPSearch Result:

Description:

ALANINE DEHYDROGENASE (EC 1.4.1.1). - BACILLUS SPHAERICUS.

Assembly ID: 3865704

Assembly Length: 810bp

[SEQ ID NO:] 3865704 Strep Assembly -- Assembly
id#3865704
CTGCGACTAGCGGATCTCAGACAGAAGGTCAATATGGAAAAGTACATGAAAATGTGATGG
ACTACTGGTTCAAAACGCATCCAGAAAATTTTTTCGATAATGTCGGACCTCTTGTAGCCA
GTAACTTTTTCATACTTACACCGAAGATTTCCACTTGATGAAGGAAATTGGAGTTAATT
CTTCCGCACTTCCATCCAATGGAGTCGACTCATCAAGAATTTAGAGACAGGTGAGCCTG
ATCCAAAAGGTATTGCTTTCACAATGCCATTTCATGGAAGAAGCTAAAAAGAACCAGATG
GATCTTGATGAATTTACATCATTTTGATTTACCAGTGGAACCTCTTCAAAAATACGGT
GGTTGGGAAAGCAAACATGTAGTGGAGTTATTCGTGAAGTTTGCCAAGACTGCTTTAACA
TGCTTTGGAGATAAGGTTCACTTACTGGACAACCTTCAATGAGCCAATGGTCATTCCAGAA
GCAGGATACTTATATGCTTTCCATTATCCAAATCTAAAAGGAAAGGGAAAAGAGGCCGTA
CAAGTCATCTATAATCTAAACCTTGCTAGTGCAAAAGTGATTCAACTATATCGCTCATT
GGACTTGATGGAAAGATTGGGATTATTTTAACTTGACACCTGCTTATCCAAGAAGTAAT
TCTCCAGAAGACTTAGAAGCAAGTCGATTTACAGATGACTTCTTTAACAAGTCTTCCTT
GAATCCAGCTGTTAAAGGAACCTTCCAGAAAAGATTGGTAAAAACAGCTAGAGAGAGAT
GGCGTGTTATGGAGTCATACCGAAAAAGAG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	232	735	F	168 aa

[SEQ ID NO:] 3865704-6 ORF translation from 232-735,
direction F
VSLIQKVLLSTMPFMEEAKKNQMDLVMNLHHFDLPVELLQKYGGWESKHVVELFVKFAKT
ALTCFGDKVHYWTTFNPMVIPEAGYLYAFHYPNLKGKGKEAVQVIYNLNLASAKVIQLY
RSLGLDGGKIGIILNLT PAYPRSNSPEDLEASRFTDDFFNKVFLESSC*

Blastp and/or MPSearch Result:

Description:

BETA-GLUCOSIDASE A (EC 3.2.1.21) (GENTIOBIASE) (CELLOBIASE)
(BETA-D- GLUCOSIDE GLUCOHYDROLASE). - CLOSTRIDIUM
THERMOCELLUM.

Assembly ID: 3865788
Assembly Length: 437bp

[SEQ ID NO:] 3865788 Strep Assembly -- Assembly
id#3865788
AATTTCGCGTATCTCCCTCTTCCCTAACGATTGCTGAAAAATGAGTGGAGGAAAGTTTAAT
ACCATCTCCAGTGTAAATGGTAAATTCCTCTTTTCGAAACATTTTTTATCATTACTCCTGC
CCGTTTGTATTACGATATCAGTAGTATAAAATCGACCCTCTCCCCAAAAGAAATTACGTCT
TACATTTTTATTTCAATTTTCATATAAACTACTCTCTCAACTCAATTTTGATTACGCTA
TCAATCAAGTCTGGTAATGGATAGGTAAATGTGGAACCTCTCCAACTGTGCAAAACAA
ATTCCTTTGTAGGCATTGGTCGTCAGCTTTCTGAAATTTTCACCTCACTTCCATCATGA
AGAAAGCTCATTTCTTTTACGTTTTCTTTACTAATAACCAAGAAGAGCTAAAGGACCTATA
GGTTGTTCAAATACATG

ORF Predictions:

ORF #	Start	End	Direction	Length
6	210	344	R	45 aa

[SEQ ID NO:] 3865788-6 ORF translation from 210-344,
direction R
VKISESWTTNAYKGICFAQFGVPHFTYPLPDLIDSVIKIELRE*

Blastp and/or MPSearch Result:

Description:
unknown

Provided in Table 2 is information on the direction of the ORF (forward or reverse) for each polynucleotide in Table 1. Also listed for each ORF is its start and stop codon positions (refer to the columns containing nucleotide code labeled "Start" and "Stop"). The triplet codon sequence for each start and stop codon is also shown. These codons may be shown in the sense orientation or antisense orientation, such as GTG and CAC, respectively, for start codons. The "Length" column discloses the length of each polynucleotide assembly. The direction of translation on the polynucleotide depicted is denoted by and "Forward" for forward or and "Reverse" for reverse (or being on the opposite strand from the one depicted). As indicated above, the "Assembly ID" number is a unique identifier assigned to each ORF of Table 1 and allows a correlation between the data in Tables 1 and 2.

TABLE 2

Quality Assembly	ORF	Codon	Codon	Position	Position	Length	Direction
ID	#	Start	Stop	Start	Stop		
Full 3047950	6	~CAC	TCA~	2	451	150	Reverse
Full 3049152	6	~CAC	TCA~	24	407	128	Reverse
Full 3174820	7	GTG	TAG	598	1041	148	Forward
Full 3175500	8	GTG	TAG	714	1049	112	Forward
Full 3175674	6	GTG	TAG	126	314	63	Forward

Quality Assembly	ORF	Codon	Codon	Position	Position	Length	Direction
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	ID	#	Start	Stop	Start	Stop		
Full	3176442	6	GTG	TGA	350	478	43	Forward
Full	3176630	6	GTG	TAA	273	419	49	Forward
Full	3176662	6	~CAC	TTA~	2	226	75	Reverse
Full	3857692	6	GTG	TAA	386	634	83	Forward
Full	3857944	7	~CAC	TCA~	1332	1475	48	Reverse
Full	3858118	7	~CAC	CTA~	948	1160	71	Reverse
Full	3858152	6	~CAC	TCA~	546	836	97	Reverse
Full	3858258	6	GTG	TAA	207	722	172	Forward
Full	3858314	6	~CAC	TTA~	5	661	219	Reverse
Full	3858368	9	~CAC	TCA~	1207	1578	124	Reverse
Full	3858556	6	GTG	TAA	49	702	218	Forward
Full	3858562	6	~CAC	TTA~	14	178	55	Reverse
Full	3858656	6	GTG	TAA	245	559	105	Forward
Full	3859118	6	GTG	TGA	314	661	116	Forward
Full	3860084	6	~CAC	CTA~	294	473	60	Reverse
Full	3860172	8	~CAC	TCA~	1724	1888	55	Reverse
Full	3860242	7	GTG	TAA	573	1001	143	Forward
Full	3860282	6	GTG	TAA	288	1190	301	Forward
Full	3860296	8	~CAC	TCA~	1697	1843	49	Reverse
Full	3860406	6	GTG	TAA	148	504	119	Forward
Full	3860406	7	GTG	TAA	497	1405	303	Forward
Full	3860416	6	~CAC	TTA~	72	281	70	Reverse
Full	3860712	6	~CAC	CTA~	74	499	142	Reverse
Full	3860728	6	GTG	TAG	259	519	87	Forward
Full	3860794	6	~CAC	TTA~	184	915	244	Reverse
Full	3860830	6	GTG	TGA	176	286	37	Forward
Full	3860984	6	GTG	TAA	113	520	136	Forward
Full	3861088	6	~CAC	TTA~	46	474	143	Reverse
Full	3861138	6	GTG	TAG	42	437	132	Forward
Full	3861256	6	~CAC	TTA~	13	207	65	Reverse
Full	3861256	7	~CAC	TTA~	236	529	98	Reverse
Full	3861262	6	GTG	TGA	181	594	138	Forward
Full	3864150	7	GTG	TAA	922	1998	359	Forward
Full	3864150	8	GTG	TAG	2031	2759	243	Forward
Full	3864190	8	GTG	TAG	1259	1534	92	Forward
Full	3864204	8	~CAC	TTA~	1092	1835	248	Reverse
Full	3864212	6	~CAC	TCA~	256	1155	300	Reverse
Full	3864214	9	~CAC	TCA~	2812	3150	113	Reverse
Full	3864226	8	GTG	TAG	1992	2744	251	Forward
Full	3864242	6	GTG	TAA	376	1002	209	Forward

Quality	Assembly	ORF	Codon	Codon	Position	Position	Length	Direction
	ID	#	Start	Stop	Start	Stop		
Full	3864254	6	~CAC	CTA~	117	833	239	Reverse
Full	3864296	7	~CAC	TTA~	944	1777	278	Reverse
Full	3864296	10	~CAC	TTA~	2323	2694	124	Reverse
Full	3864300	9	GTG	TAA	2479	2823	115	Forward
Full	3864312	7	~CAC	TCA~	736	906	57	Reverse
Full	3864336	6	~CAC	TTA~	295	2232	646	Reverse
Full	3864344	8	~CAC	TTA~	1147	1503	119	Reverse
Full	3864352	6	~CAC	TCA~	303	1808	502	Reverse
Full	3864352	7	~CAC	CTA~	1818	2528	237	Reverse
Full	3864366	7	GTG	TAA	939	1670	244	Forward
Full	3864384	8	~CAC	CTA~	1717	2025	103	Reverse
Full	3864400	7	GTG	TAA	371	937	189	Forward
Full	3864416	7	~CAC	TTA~	929	1189	87	Reverse
Full	3864424	7	~CAC	TCA~	388	1008	207	Reverse
Full	3864430	7	GTG	TGA	627	1100	158	Forward
Full	3864442	7	GTG	TAA	867	1322	152	Forward
Full	3864442	8	GTG	TAA	1562	2074	171	Forward
Full	3864450	7	GTG	TAA	897	1448	184	Forward
Full	3864482	6	~CAC	TCA~	505	1170	222	Reverse
Full	3864496	6	~CAC	TCA~	1	1128	376	Reverse
Full	3864514	6	~CAC	TTA~	551	937	129	Reverse
Full	3864518	8	~CAC	CTA~	1985	2371	129	Reverse
Full	3864522	7	~CAC	TTA~	310	1458	383	Reverse
Full	3864568	6	GTG	TAA	296	493	66	Forward
Full	3864590	6	~CAC	CTA~	125	511	129	Reverse
Full	3864596	11	GTG	TAA	1915	2097	61	Forward
Full	3864624	6	GTG	TAA	446	751	102	Forward
Full	3864630	8	GTG	TAA	663	953	97	Forward
Full	3864654	9	GTG	TAA	1878	2306	143	Forward
Full	3864658	7	~CAC	TTA~	892	1029	46	Reverse
Full	3864664	7	GTG	TAG	675	1727	351	Forward
Full	3864700	6	~CAC	TTA~	480	740	87	Reverse
Full	3864706	6	~CAC	CTA~	336	626	97	Reverse
Full	3864710	6	GTG	TAA	442	972	177	Forward
Full	3864710	7	GTG	TGA	1247	1438	64	Forward
Full	3864724	6	~CAC	TTA~	133	1197	355	Reverse
Full	3864734	7	GTG	TAA	897	1601	235	Forward
Full	3864740	6	~CAC	CTA~	4	264	87	Reverse
Full	3864792	6	~CAC	TTA~	346	1149	268	Reverse
Full	3864830	6	~CAC	CTA~	515	1123	203	Reverse

Full	3864830	7	~CAC	TTA~	1134	1322	63	Reverse
Quality	Assembly	ORF	Codon	Codon	Position	Position	Length	Direction
	ID	#	Start	Stop	Start	Stop		
Full	3864848	6	~CAC	TTA~	707	1546	280	Reverse
Full	3864878	6	GTG	TAA	95	622	176	Forward
Full	3864950	6	~CAC	TCA~	198	500	101	Reverse
Full	3864954	6	GTG	TGA	414	1070	219	Forward
Full	3864962	6	~CAC	TTA~	195	602	136	Reverse
Full	3864970	7	GTG	TAA	1309	1710	134	Forward
Full	3865012	7	~CAC	CTA~	584	973	130	Reverse
Full	3865148	6	~CAC	TCA~	256	423	56	Reverse
Full	3865148	7	~CAC	CTA~	731	868	46	Reverse
Full	3865178	6	~CAC	TTA~	182	580	133	Reverse
Full	3865260	6	~CAC	CTA~	19	399	127	Reverse
Full	3865260	7	~CAC	TTA~	272	793	174	Reverse
Full	3865260	8	~CAC	TTA~	786	1073	96	Reverse
Full	3865272	6	GTG	TAA	101	193	31	Forward
Full	3865280	7	GTG	TGA	815	1204	130	Forward
Full	3865286	6	GTG	TAA	146	250	35	Forward
Full	3865326	7	GTG	TAA	100	681	194	Forward
Full	3865438	6	~CAC	TTA~	75	407	111	Reverse
Full	3865446	6	~CAC	TTA~	42	326	95	Reverse
Full	3865474	6	GTG	TAA	243	659	139	Forward
Full	3865476	6	GTG	TGA	394	603	70	Forward
Full	3865502	6	GTG	TAA	428	877	150	Forward
Full	3865694	6	~CAC	TTA~	59	334	92	Reverse
Full	3865704	6	GTG	TAA	232	735	168	Forward
Full	3865788	6	~CAC	CTA~	210	344	45	Reverse

EXAMPLES

The examples below are carried out using standard techniques, which are well known and routine to those of skill in the art, except where otherwise described in detail. The examples are illustrative, but do not limit the invention.

Example 1**Isolation of DNA coding for a virulence gene in *Streptococcus pneumoniae***

As mentioned above each of the DNAs disclosed herein by virtue of the fact that it includes an intact open reading frame is useful to a greater or lesser extent as a screen for identifying antimicrobial compounds. A useful approach for selecting the preferred DNA sequences for screen development is evaluation by insertion-duplication mutagenesis. This system disclosed by Morrison et al., J. Bacteriol. 159:870 (1984), is applied as follows.

Briefly, random fragments of *Streptococcus pneumoniae*, strain 0100993 DNA are generated enzymatically (by restriction endonuclease digestion) or physically (by sonication based shearing) followed by gel fractionation and end repair employing T4 DNA polymerase. It is preferred that the DNA fragments so produced are in the range of 200-400 base pairs, a size sufficient to ensure homologous recombination and to insure a representative library in *E.coli*. The fragments are then inserted into appropriately tagged plasmids as described in Hensel et al., Science 269: 400-403(1995). Although a number of plasmids can be used for this purpose, a particularly useful plasmid is pJDC9 described by Pearce et al., Mol. Microbiol. 9:1037 (1993) which carries the *erm* gene facilitating erythromycin selection in either *E. coli* or *S. pneumoniae* previously modified by incorporation of DNA sequence tags into one of the polylinker cloning sites. The tagged plasmids are introduced into the appropriate *S. pneumoniae* strain selected, inter alia, on the basis of serotype and virulence in a murine model of pneumococcal pneumonia.

It is appreciated that a seventeen amino acid competence factor exists (Havastein et al., Proc. Nat'l. Acad. Sci. USA 92:11140-44 (1995)) and may be usefully employed in this protocol to increase the transformation frequencies. A proportion of transformants are analysed to verify homologous integration and as a check on stability. Unwanted levels of reversion are minimized because the duplicated regions will be short (200-400 bp), however if significant reversion rates are encountered they may be modulated by maintaining antibiotic selection during the growth of the transformants in culture and/or during growth in the animal.

The *S. pneumoniae* transformants are pooled for inoculation into mice, eg., Swiss and/or C57B1/6. Preliminary experiments are conducted to establish the optimum complexity of the pools and level of inoculum. A particularly useful model has been described by Veber et al. (J. Antimicrobiol. Chemother. 32:432 (1993) in which 10^5 cfu inocula sizes are introduced by mouth to the trachea. Strain differences are observed with respect to onset of disease e.g., 3-4 days for Swiss mice and 8-10 days for C57B1/6.

Infection yields in the lungs approach 10^8 cfu/lung. IP administration is also possible when genes mediating blood stream infection are evaluated. Following optimization of parameters of the infection model, the mutant bank normally comprising several thousand strains is subjected to the virulence test. Mutants with attenuated virulence are identified by hybridization analysis using the labelled tags from the "input" and "recovered" pools as probes as described in Hensel *et al.*, *Science* 269: 400-403(1995). *S. pneumoniae* DNA is colony blotted or dot blotted, DNA flanking the integrated plasmid is cloned by plasmid rescue in *E. coli* (Morrison *et al.*, *J. Bacteriol.* 159:870 (1984)) and sequenced. Following sequencing, the DNA is compared to the nucleotide sequences given herein and the appropriate ORF is identified and function confirmed for example by knock-out studies. Expression vectors providing the selected protein are prepared and the protein is configured in an appropriate screen for the identification of anti-microbial agents. Alternatively, genomic DNA libraries are probed with restriction fragments flanking the integrated plasmid to isolate full-length cloned virulence genes whose function can be confirmed by "knock-out" studies or other methods, which are then expressed and incorporated into a screen as described above.

What is claimed is 1. An isolated polynucleotide comprising a polynucleotide sequence selected from the group consisting of:

- (a) a polynucleotide having at least a 70% identity to a polynucleotide encoding a polypeptide comprising an amino acid sequence of Table 1;
- (b) a polynucleotide having at least a 70% identity to a polynucleotide encoding a mature polypeptide expressed by the gene contained in the *S. pneumoniae* of the deposited strain that was sequenced to obtain a polynucleotide sequence of Table 1;
- (c) a polynucleotide encoding a polypeptide comprising an amino acid sequence which is at least 70% identical to an amino acid sequence of Table 1;
- (d) a polynucleotide which is complementary to the polynucleotide of (a), (b) or (c); and
- (e) a polynucleotide comprising at least 15 sequential bases of the polynucleotide of (a), (b), (c) or (d).

- 2. The polynucleotide of Claim 1 wherein the polynucleotide is DNA.
- 3. The polynucleotide of Claim 1 wherein the polynucleotide is RNA.
- 4. The polynucleotide of Claim 2 comprising the nucleic acid sequence selected from the group consisting of the nucleic acid sequences set forth in Table 1.

5. The polynucleotide of Claim 2 which encodes a polypeptide comprising an amino acid sequence selected from the group consisting of the amino acid sequences set forth in Table 1.

- 6. A vector comprising the polynucleotide of Claim 1.
- 7. A host cell comprising the vector of Claim 6.
- 8. A process for producing a polypeptide comprising: expressing from the host cell of Claim 7 a polypeptide encoded by said DNA.

9. A process for producing a polypeptide or fragment comprising culturing a host of claim 7 under conditions sufficient for the production of said polypeptide or fragment.

10. A polypeptide comprising an amino acid sequence which is at least 70% identical to an amino acid sequence selected from the group consisting of the amino acid sequences set forth in Table 1.

11. A polypeptide comprising an amino acid sequence selected from the group consisting of the amino acid sequences set forth in Table 1.

12. An antibody against the polypeptide of claim 10.

13. An antagonist or agonist of the activity or expression of the polypeptide of claim 10.

14. A method for the treatment or prevention of disease of an individual comprising: administering to the individual a therapeutically effective amount of the polypeptide of claim 10.

15. A method for the treatment of an individual having need to inhibit a bacterial polypeptide comprising: administering to the individual a therapeutically effective amount of the antagonist of Claim 13.

16. A process for diagnosing a disease related to expression or activity of the polypeptide of claim 10 in an individual comprising:

- (a) determining a nucleic acid sequence encoding said polypeptide, and/or
- (b) analyzing for the presence or amount of said polypeptide in a sample derived from the individual.

17. A method for identifying compounds which interact with and inhibit or activate an activity of the polypeptide of claim 10 comprising:

contacting a composition comprising the polypeptide with the compound to be screened under conditions to permit interaction between the compound and the polypeptide to assess the interaction of a compound, such interaction being associated with a second component capable of providing a detectable signal in response to the interaction of the polypeptide with the compound;

and determining whether the compound interacts with and activates or inhibits an activity of the polypeptide by detecting the presence or absence of a signal generated from the interaction of the compound with the polypeptide.

18. A method for inducing an immunological response in a mammal which comprises inoculating the mammal with the polypeptide of claim 10, or a fragment or variant thereof, adequate to produce antibody and/or T cell immune response to protect said animal from disease.

19. A method of inducing immunological response in a mammal which comprises delivering a nucleic acid vector to direct expression of a polypeptide of claim 10, or fragment or a variant thereof, for expressing said polypeptide, or a fragment or a variant thereof *in vivo* in order to induce an immunological response to produce antibody and/ or T cell immune response to protect said animal from disease.

20. A polynucleotide comprising a polynucleotide sequence selected from the group consisting of the the first ten polynucleotides sequences from the top of Table 1.

21. A polypeptide comprising a polypeptide encoded by the polynucleotide of claim 20.

22. The isolated polynucleotide of claim 1 wherein said nucleotide is selected from the group consisting of:

(a) a polynucleotide having at least a 90% identity to a polynucleotide encoding a polypeptide comprising the amino acid sequence of Table 1;

(b) a polynucleotide having at least a 90% identity to a polynucleotide encoding the same mature polypeptide expressed by the gene contained in the *S. pneumoniae* of the deposited strain that was sequenced to obtain a polynucleotide sequence of Table 1;

(c) a polynucleotide encoding a polypeptide comprising an amino acid sequence which is at least 90% identical to the amino acid sequence of Table 1;

(d) a polynucleotide which is complementary to the polynucleotide of (a), (b) or (c); and

(e) a polynucleotide comprising at least 15 sequential bases of the polynucleotide of (a), (b), (c) or (d).

23. The isolated polynucleotide of claim 1 selected from the group consisting of:

(a) a polynucleotide having at least a 95% identity to a polynucleotide encoding a polypeptide comprising the amino acid sequence of Table 1;

(b) a polynucleotide having at least a 95% identity to a polynucleotide encoding the same mature polypeptide expressed by the gene contained in the *S. pneumoniae* of the deposited strain that was sequenced to obtain a polynucleotide sequence of Table 1;

(c) a polynucleotide encoding a polypeptide comprising an amino acid sequence which is at least 95% identical to the amino acid sequence of Table 1;

(d) a polynucleotide which is complementary to the polynucleotide of (a), (b) or (c); and

(e) a polynucleotide comprising at least 15 sequential bases of the polynucleotide of (a), (b), (c) or (d).

24. An isolated polynucleotide comprising a polynucleotide sequence selected from the group consisting of:

(a) a polynucleotide having at least a 50% identity to a polynucleotide encoding a polypeptide comprising the amino acid sequence of Table 1 and obtained from a prokaryotic species other than *S. pneumoniae*;

- (b) a polynucleotide encoding a polypeptide comprising an amino acid sequence which is at least 50% identical to the amino acid sequence of Table 1 and obtained from a prokaryotic species other than *S. pneumoniae*; and
 - (c) a polynucleotide which is complementary to the polynucleotide of (a) or (b).
- 25. An isolated Streptococcal polypeptide having one of the amino acid sequences given in Table 1.
 - 26. An isolated nucleic acid encoding one of the amino acid sequences of Claim 1 and nucleic acid sequences capable of hybridizing therewith under stringent conditions.
 - 27. Recombinant vectors comprising the nucleic acid sequences of Claim 26 and host cells transformed or transfected therewith.
 - 28. A method of identifying an antimicrobial compound comprising contacting candidate compounds with a polypeptide of Claim 1 and selecting those compounds capable of inhibiting the bioactivity of said polypeptide.
 - 29. Antimicrobial compounds identified by the method of Claim 28.
 - 30. An isolated Streptococcal polypeptide having one of the amino acid sequences given in Table 1.
 - 31. An isolated nucleic acid encoding one of the amino acid sequences of Claim 30 and nucleic acid sequences capable of hybridizing therewith under stringent conditions.
 - 32. Recombinant vectors comprising the nucleic acid sequences of Claim 31 and host cells transformed or transfected therewith.
 - 33. A method of identifying an antimicrobial compound comprising contacting candidate compounds with a polypeptide of Claim 30 and selecting those compounds capable of inhibiting the bioactivity of said polypeptide.
 - 34. Antimicrobial compounds identified by the method of Claim 33.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/21976

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :Please See Extra Sheet.

US CL :Please See Extra Sheet.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 435/69.1, 320.1, 4, 252.3; 536/23.1, 23.7; 530/350, 386; 514/1, 12

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Dialog, APS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y,E	US 5,695,937 A (KINZLER et al.) 09 December 1997, see entire document.	1-34
Y,E	US 5,723,320 A (DEHLINGER) 03 March 1998, see entire document.	1-34
Y,P	US 5,604,100 A (PERLIN) 18 February 1997, see entire document.	1-34
Y,P	US 5,652,128 A (JARVIK) 29 July 1997, see entire document.	1-34

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
E earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*A* document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means	
P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

12 MARCH 1998

Date of mailing of the international search report

02 APR 1998

Name and mailing address of the ISA/US
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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER:

IPC (6):

C07H 21/02, 21/04; C12N 15/00; C12P 21/00; C07K 14/00; A61K 35/14, 38/00; C12Q 1/00

A. CLASSIFICATION OF SUBJECT MATTER:

US CL :

435/69.1, 320.1, 4, 252.3; 536/23.1, 23.7; 530/350, 386; 514/1, 12